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How to Make Capital Controls Work

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Distinguishing this article, which does not fail to cover the particulars of a capital outlay programming, approval, and review procedure, is a well articulated expression of the policies which underlie a capital controls program and so, basically, control it. The procedural narrative which succeeds this initial material and illustrates application of the policies set forth, is accompanied by a helpful degree of explanatory comment.

IT SEEMS SAFE TO SAY that today no phase of business management is more important to the progress of individual industries and the well-being of the economy as a whole than control of capital expenditures. Our increased knowledge of the way in which the economy functions has made us acutely aware of the need for continuous expansion. However, this expansion must be planned to fit the population growth and technological advancement. As a result, it is an area of delicate balance, where too much can be as disastrous as too little. A business enterprise needs an adequate control system to see that both extremes are avoided.

The specific control system on which this article is based is one developed by Sylvania Electric Products, Inc. Undoubtedly it has features in common with the program of many other companies. However, it also includes special procedures which are necessitated by the particular position of the electrical-electronics industry. In short, generally accepted control mechanisms have been tailored to fit the specific requirements of a fast-growing industry. The extent of this growth may be indicated by recalling that consumption of electric power doubled between 1943 and 1954 and will probably have doubled again by the

end of another decade, and then noting that the expansion of the electrical-electronics industry has been even greater. Not all divisions of the field have experienced the same degree and kind of growth. On the one hand, there is the relatively stable lighting business with a history of steady expansion based on more extensive use of electricity, along conventional lines, in homes and industry. Here, the rate of growth has been approximately equal to the increased rate of electric power consumption. On the other hand, there is the electronics area of the industry, including manufacture of receiving tubes, special electronic tubes, and various electronic devices. Here, the growth rate has been prodigious and has been characterized by turbulence and surprise. In line with this growth, Sylvania's annual sales volume has grown from approximately $60 million in 1943 to almost $300 million in 1953 and permanent plant and equipment assets have increased from $3½ million to approximately $60 million.

This rapid growth has exerted tremendous pressure on the resources of the industry and has created an almost insatiable demand for capital. These developments were difficult to anticipate but certainly have highlighted the importance of sound planning. Sylvania's position in this extraordinary picture has strongly influenced the kind of capital control system we have developed. Likewise, a satisfactory system for any business must be tailored to fit the particular industry and company requirements. However, the control mechanism is basically the same for all industry and it seems possible to take a common approach by first setting forth the *policies* upon which our program is to be based. Some of the major items, indicative of the points which must be resolved before a program is formulated, will be given attention in the paragraphs immediately following and will be succeeded by consideration of programming particular projects.

Policy as to Return on Investment and Investment Protection

This is the $64 one—perhaps the granddaddy of all business policies. It belongs at the head of the list in any business discussion and it reminds us of our common objective, regardless of specific differences in the nature of our business. In a sense, we are all in the investment business. We all take monies from the same sources—stockholders (common, pfd.), long term loans (bonds, etc.), short term loans, open accounts payable, sale of assets, lease backs, etc. We all put the monies to work in about the same general way (buy productive equipment, buy labor and material, and buy sales and distribution talent). We all try to turn the money over as often as possible with maximum margin of profit on each turn. The process goes from cash to inventories to receivables

and back to cash. The object is to get enough cash to pay monies back to original sources plus dividends and still have a residue for expansion. So, all firms have a common objective, a common prime policy, i.e., satisfactory return on investment.

One philosophy holds that an investment in capital assets, particularly if for expansion, should provide a return equal to or greater than present return on investment. Otherwise, the earnings rate of present owners or stockholders is diluted. This conclusion is controversial because it could seriously impede progress and jeopardize earnings. "The old wheel turns", for profitable industry or products of yesterday may be only a memory today and less profitable new ventures of today may be our mainstay tomorrow. To protect future return, it is frequently necessary to sacrifice or dilute some portion of the current return. In establishing a philosophy on this point and determining the satisfactory percentage of return, it is essential to consider firm policy on investment protection.

It is assumed, of course, that investment protection policies will include procedures and insurance to protect against dishonesty and various disaster possibilities. What I particularly want to cover here is the risk factors involved in running a successful progressive business. While return on investment is generally recognized as the motivating objective of business enterprise, the first responsibility of fixed capital management, from the financial manager's point of view, is to retain intact the capital originally and subsequently invested. If the capital investment is dissipated, there can be no return because there will be no business left. So, it is obviously important that operating plans and other policies of the business be in harmony with the policy on investment protection. However, in establishing this policy we must recognize that, in a large measure, the degree of protection will be directly related to the desired return on investment. Generally, we cannot expect higher than average return without assuming greater risk. On the other hand, if we swing one hundred percent to the financial manager's viewpoint, and demand positive protection of investment, we must be satisfied with a minimum return, perhaps two or three percent, and we had better put our money in the savings bank in the first place. So, return on investment policy is inter-related to the policy on investment protection. Selection of a balance point is an individual matter for each business, depending somewhat upon the type of industry and the attitude of the owners or stockholders.

Because of the variation in circumstances, there seems to be no good rule of thumb which can be applied universally, so I merely make the point that business is a gamble and there is always some risk. To survive in the future, it is essential to keep up to date in your field, even though it means sacrifice of some portion of current earnings. You cannot proceed to formulate intelligently

SYLVANIA CAPITAL EXPENDITURES CONTROL

EXHIBIT – 1

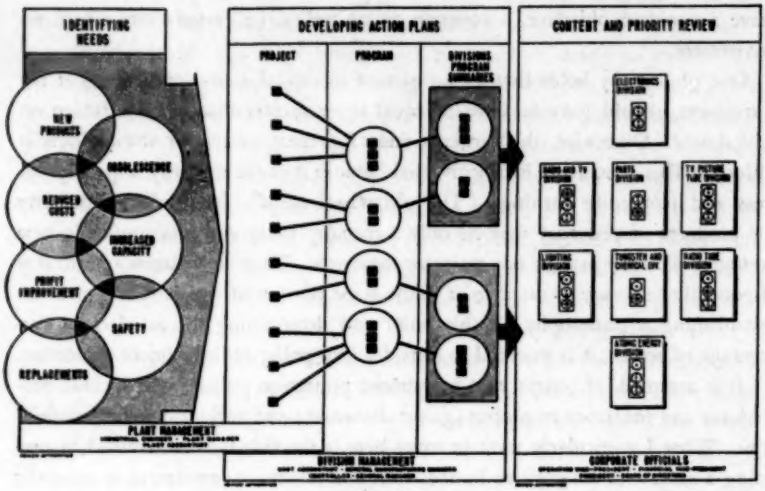

EXHIBIT 1

other operating plans and policies until you have established your philosophy on these two basic policies, return on investment and investment protection.

Policy as to Replacement Funding

I do not intend to go into the whole broad subject of business financing because that subject alone would require many articles for adequate coverage. In fact, I am referring here only to a financing plan for replacement of existing assets. Actually, this is closely related to investment protection policies in the sense that a plan to provide funds for replacement of assets may also be a plan which ensures the constancy of fixed capital. To accomplish both, it is necessary to retain in the business each year cash, securities, or other assets at least equal to the amount of depreciation of fixed assets. This means "true" depreciation. So, in establishing the minimum needed to meet this requirement, book depreciation cannot be used unless it takes into consideration the difference between depreciable and "true" life, possible obsolescence before life expiration, and possible higher cost of replacement either because of inflation or new improved machinery or facilities. Actually, many variations from straight line depreciation do make corrections for some of these factors.

However, we should not rely completely upon any mechanical formula to solve the problem, because failure to establish a realistic policy giving proper consideration to all factors can result in dissipation of fixed capital, which may ruin or seriously handicap any business when replacement of worn out or obsolete facilities becomes necessary. There is the simple case of dissipating depreciation reserve by cash distributions representing return of capital, known to some as "milking the business," but perhaps the most tragic awakening is experienced by the fellow who has religiously set aside funds represented by depreciation, but did not take into account higher replacement costs brought about through general economic inflation. Even though the Internal Revenue Service will not allow depreciation based upon replacement cost, it is essential to consider this factor before declaring dividends, part of which could in reality represent a distribution of working capital needed in the business for future replacement of fixed capital assets. This may explain the retention of 50 percent of earnings by most corporations. Even those who do not plan on expansion should retain liberal amounts to cover higher costs of replacement. The best policy, of course, is to make calculations of inflationary effects each year and set aside the correct amount to cover.

After the determination of an adequate amount to be set aside, there are several alternative methods of retaining such assets in the business. Some of the basic ones include:

1. Paying off long term or other business debt. The safest investment you can make is to buy up your own obligations.
2. Establishing a replacement fund in cash or gilt edge securities. This is safe but the yield is poor, so the effect may be idling cash at low interest rates.
3. Reinvesting funds in the business within limits indicated by long-term replacement and financing estimates. More risk is involved here but it represents a reasonable compromise for it provides an opportunity for good return on cash invested. Using this plan, it is well to adjust the net worth section of the balance sheet to deduct from the "undistributed earnings" account, and show separately the amount held in the business to provide for excess replacement cost.

Progress, Capitalization, and Project Approval as Policies

There is usually no third choice. A firm either goes ahead or falls back. In most fields we cannot expect to maintain the *status quo*. One danger is that stagnation frequently produces greater profit for a short period. Those who fall into this trap are actually milking the business and are usually bound for ultimate failure. Progress means keeping up to date or ahead in your field, or expansion by increased volume or additional lines. It may be either or both of these. The policy decision in this area requires familiarity with developments in the industry and business generally. Proper choice of financing method is important to either kind of progress. Such may be by means of issuing capital

SUMMARY OF ANNUAL ADDED PROFIT

_____ Division P. P. R. No. _____

	Additional Expense	Savings or Additional Income
	$	$
1. Net Sales		
2. Cost of Sales:		
Raw Materials		
Direct Labor		
Overhead Labor		
Overhead (Out of Pocket)		
3. Distribution Expenses (Out of Pocket)		
4. Administrative Expense (Out of Pocket)		
5. Total	$	$
6. Added Annual Profit Before Depreciation & Income Taxes		$
7. Additional Depreciation Expense		
8. Added Annual Profit before Tax		$
9. Estimated Federal Income Tax(@ 52%)		
10. Added annual profit before depreciation after Income Tax (6 - 9)		$

EXHIBIT 2

stock, borrowing, or using retained earnings. The problem of whether to capitalize or expense an expenditure is difficult but a general guide somewhat along the following lines may be appropriate:

CAPITALIZE	EXPENSE
Additions	Maintenance and repair
Replacements	Insurance
Renewals	Property taxes
Betterments	Interest
Original installation	etc.

Starting from this general division of expenditure, it must be recognized that accounting and tax rules are both flexible and indefinite. There are some specific regulations but much is left to judgment of business management. Generally, as a practical matter, we should expense every dollar within legal tax limits. This minimizes taxes and preserves cash. To get maximum tax and cash advantage we would (1) expense items of doubtful use or life, such as experimental and development items, (2) expense items physically small or delicate if possibility of theft or breakage is high, (3) on capital items, consider physical life in terms of satisfactory quality and efficiency as well as possible obsolescence of either equipment or product and, of course, use the shortest time indicated

by any of these factors, and (4) select depreciation on the sum of the digits, declining balance, or some other method which would give us the highest depreciation allowance. This approach will result in maximum write offs on a current basis.

But we may not want maximum write offs. There are some considerations on the other side of this picture. Under the following situations, maximum write offs may not be desirable:

1. No taxable income anticipated in current year or immediate future, for reasons such as new business, heavy expansion or research program, recession forecast, and losses of prior years to be carried forward (offsetting current profit).
2. Anticipated increased tax rate.
3. Impact on financial statements. Public reaction (or private banking reaction) might affect future or immediate financing. This would not be a factor in privately owned and privately financed business.
4. Danger of overpricing product.

All factors must be weighed carefully, but I repeat that, generally, it is practical economics to expense to the legal limit. Speculation in tax rates is not our specialty and probability of extended periods of loss is not likely if we plan to stay in business. One last point in determining policies on capitalization versus expense is the importance of making good initial decisions, because they are likely to be binding on future transactions. Basic to Sylvania's system of capital expenditures has been a philosophy of maximum decentralization of control. Authority and responsibility for planning and carrying out operations have been delegated to division and plant managers, but central management is equipped with the minimum controls necessary to assure results. Exhibit 1 is indicative.

Development of Capital Outlay Programs — The Idea of "Search"

After the basic policies have been established, we are ready to examine the process of setting up a programmed control system to implement them. As the first step in presenting Sylvania's capital controls system, I should like to offer a definition of a program. There are certainly various good definitions but, for our purpose, I have defined a program as "a summary of related expenditures of proposals covering a specific integrated plan." This seems to be an adequate definition of any good overall operating program which is properly integrated. But the overall program is not really properly integrated if it unwittingly forces future expenditures not included as part of the approved operating plan. For example, sales estimates may indicate that, two years from now, the volume of our profitable products will require ten more manufacturing machine units than we have now. If it takes twenty months to build these units, we must get im-

TWO YEAR CAPITAL EXPENDITURE PROGRAM SUMMARY

(000 Omitted)

Priority Rating	Program No.	Title of Program	Requisitions Already Approved	Amounts Already Spent		
			1	UP & WIP 2	Capitalized 3	Total 4

Cash Outlay Needed to Complete Program										
1955										
For Approved Requisitions	New Money	Total	1956	Beyond	Total	Total Expense Required	Working Capital Required	*Total Cost of Program	Savings or Profit Improvement	Return on Inv. %
5	6	7	8	9	10	11	12	13	14	15

Notes:

1. *Total cost includes all funds spent or to be spent, necessary to attain earnings or savings.
2. Leave every fifth horizontal line blank to assist in reading schedule.
3. UP - Expenditures held in unfinished plant.
   WIP - Expenditures held in work in process.

EXHIBIT 3

mediate budget approval and place construction orders for the machinery (and, of course, the treasurer plans cash availability to pay for this equipment). But what a shock he gets if the first three new units delivered completely fill our present building facilities and the manufacturing boys hastily submit a requisition for purchase or construction of a new building and other facilities to accommodate the remaining seven new units. To avoid these surprises, we need a proper planning job and to insure this at Sylvania, the total overall program or budget is composed of many individual projects or programs, each one in itself being a "summary of related expenditures or proposals covering a specific integrated plan." An item cannot get on the list if it is not associated with one of these projects (or programs, as we call them) unless, of course, it happens to represent a complete program in itself. A program will not get approval without including or indicating all of the capital or expense items involved, now or in the future.

Next, let us review the preparation procedure. The first question is, where do we get our facts? i.e., what is the source of information? Obviously, we have to conduct a search by means of market research, engineering research, and cost analysis. I do not believe the aspect of search in relation to capital expenditures can be emphasized too strongly. In Sylvania, we encourage this search in a number of ways. First, we are constantly reviewing our sales position by product lines, forecasting five years ahead, and scrutinizing our competition to make certain we are holding our own or better on volume. Market Research plays a prominent role. It gives us much better estimates than we would get by relying

solely upon past experience. Second, through engineering research, we are developing entirely new products. These may entail outlays for new plants, complex equipment, and, from the financial standpoint, losses over a considerable period until starting-load costs are absorbed. Third, continuous cost analyses identify areas in which greater efficiency is required if we are to continue to meet and improve upon competitive prices.

After we assemble this information, the next question is "How do we evaluate it?" As a result of the information stimulants, we have more investment proposals submitted than available capital can accommodate. Naturally, we regard this as an indication of a healthy attitude on the part of division and plant personnel in uncovering opportunities. However, it then becomes one of top management's most important jobs to select the proposals which will be of greatest benefit to the company. To aid in this selection, the submitting division or department is required to indicate the relative importance of each program in relation to other proposals the division has submitted. These proposals are subjected to qualitative and quantitative evaluation.

Evaluation and Approval of Capital Expenditure Programs

Qualitative criteria which we apply in selecting capital programs and establishing priorities are in the nature of "urgency" evaluations. The ranking is about as follows:

1. Legal and safety requirements and necessities of a similar nature. These rank very high regardless of profitability factors.
2. Replacements of worn out or obsolete equipment.
3. Completion of projects for which we are already substantially committed. These are ordinarily carry-overs from the prior year's program.
4. Expansion or improvement necessary to retain our market position. As probably is done in most companies, we are constantly assessing our position in relation to that of the industry on all major products. Maintenance of industry position plays a big part in determining in what we invest.
5. Cost saving items on present operations (two years or less for repayment).
6. Expansion programs with high return.
7. Expansion programs with average return.
8. Cost savings items on present operation (over two years for repayment).
9. Expansion programs with intangible or long-term advantages (such programs may provide us complements to an existing line of products).
10. Others.

By way of quantitative evaluation, we compute a rate of return on the investment. Much has been written on methods of gauging investment profitability or return on investment. A drawback in some methods is the complexity that often accompanies a high degree of accounting refinement. Admittedly, we have struck a compromise in Sylvania in this respect, but it is a compromise which has given our management the most practical measurement in relation

SYLVANIA Electric Products Inc. PERMANENT PROPERTY REQUISITION

Division_____ Plant:_____ Date:_____ PPR No:_____

Program_____ Program No:_____ Plt. Req. No. :_____

1 - DESCRIPTION OF ITEMS

SUPPLIER_____ EXPECTED DELIVERY DATE____

2 - REASON FOR EXPENDITURE

WAS THIS REQUISITION INCLUDED IN APPROVED PROGRAM?_____

3 - COST TOTAL

Plant or Equipment	$_____
Transportation and Installation	$_____
Cost to be Capitalized	$_____
Less: Salvage Value Obsolete Equipment	$_____
Net Capital Outlay	$_____
Plus: Non-Recurring Expenses (S. E. R. Required)	$_____
TOTAL COST	$_____

4 - PROFIT IMPROVEMENT

Annual Added Profit $

Cash Pay Out Period:

Total Cost $_____ = _____Years_____Months

Annual Added Profit $

5 - EQUIPMENT OBSOLETED

Description and Disposition Tag No:_____

First Cost Reserve Net Book Value

6 - EXPENDITURE SUMMARY	Allocated	Previous Requisitions in Process and/or Approved	This Requisition	Unrequisioned Balance
TOTAL PROGRAM				
19___				
19___				
TOTAL DIVISION				
19___				
19___				

7 - APPROVALS	DIVISION	CORPORATE
Industrial Engineer		Operating Vice-Pres.
Plant Mgr.		Financial Vice-Pres.
Cost		President
Gen. Mfg. Mgr.		Board of Directors
Purchasing		Approval Date
Controller		
General Mgr.		

EXHIBIT 4

to our company and industry. Stated simply, the return on investment calculation we have used is the percent of additional profit to additional investment. This calculation supports each capital expenditure proposal. The form in which it is worked up is indicated by Exhibit 2. Another important quantitative consideration is the availability of funds, so, on all profit improvement programs or requisitions, we also calculate the cash payout period, i.e., the length of time it will take to get the cash back in to the till. Cash return is quite different from book profit. We figure it by adding back to book profit the depreciation figure,

because depreciation does not represent a cash outlay, and then we deduct estimated income taxes (usually using present rates for future periods). This information on cash payback is essential to the treasurer in planning future financing requirements. To summarize our evaluation process, the qualitative listing establishes priority on the basis of urgency and the quantitative evaluation indicates (1) rates of additional profit to additional investment, and (2) time required to get the actual cash back into the business.

To complete our program preparation procedure, after gathering the information and evaluating it, the proposals or programs must be prepared and presented for approval. This approval procedure follows the course which has been indicated by Exhibit 1, with program preparation normally starting at the operating level at which capital expenditure is required and calling for step-by-step approval at each higher level of management. Our procedure requires that annually on November, each division or major department submit to the corporate office in New York its expenditure plans for the next two years. This is submitted on a form entitled capital expenditure program summary (Exhibit 3) used to record the key control facts on each individual program, identified by consecutive numbering. It places capital expenditure forecasting on a continuous two-year basis. Supporting the summary are individual outlines covering each program in sufficient detail to enable management to review for approval. The outline of each program generally states (1) when it is anticipated that the program will be started and when it will be completed, (2) the cash outlay needed for the program and when needed, (3) additional working capital required on completion of program, (4) special expense items required by program, (5) whether or not a certificate of necessity has been issued or will be requested, and (6) the additional earnings or savings expected, (if any).

In general, then, assurance is provided that the proposal is the result of careful analysis of all factors, backed up by specific details supporting the improvements and profits claimed. The program outlines are reviewed by the top management of our company and presented to the board of directors with an appropriate summary for their overall review and approval. In many instances, the outlines list major items of equipment. However, control by top management is exercised by program total, and not by specific items. Division and plant management can and does change its mind on the specific equipment needed to complete programs as long as the scope of the program is not altered without specific corporate approval. So control on specific items within a program is delegated further down the line, to the divisions or plants or departments more familiar with the detailed requirements necessary to put over the program.

PERMANENT PROPERTY PROGRAM DETAIL
(000 Omitted)

Program Number	Title of Program	Cash Outlay – Authorized	Unfinished Plant + & Work in Process	Total 1 + 2 = 3	Capitalized = 4	Approved PP#'S = 5	Total 4 + 5 = 6	Authorized Not Approved 3 - 6 = 7	Work in Process & Unfinished Plant Balance = 8	Total Expenditure 4 + 8 = 9	Authorized Not Expended 3 - 9 = 10	Approved Not Expended 5 - 8 = 11
	Total 1954											
	Total 1955											
	Grand Total											

EXHIBIT 5

Finally, upon board approval, the president notifies the division and major department heads and it is on the basis of this approval that the next major step in the system can be initiated, the expenditure procedure, which starts with the submission of Permanent Property Requisitions (Exhibit 4). Approval of programs does not give approval to spend money. Expenditures must be authorized in accordance with our permanent property requisition procedure.

Before describing the requisition procedure, I want to emphasize one point in particular concerning the approval process and that is flexibility. I am sure it can be appreciated that, because of the volatile nature of the electronic industry, we have to be prepared to shift attention and resources rapidly from one direction to another to keep pace with changes in the state of the art and changes in market factors. It would be very unrealistic, in our industry, to consider that we had, at any time, an unalterable investment plan. For an example, in the early years of television marketing, sets ranged in size from the five to seven to twelve inch picture tube. We thought we had moved pretty fast and looked for a period of stability at about the twelve inch size. But we had only a momentary pause until we were off again to the fourteen, sixteen, nineteen and twenty-one inch tubes. Our company planned ahead and geared up not only for twenty-ones but for twenty-fours and twenty-sevens. Now color has entered the scene and there is the added uncertainty of smaller versus larger color sets, with stiff price competition from black and white sets. Undoubtedly, other companies have similar problems. This is just one example illustrating the need for flexibility and continuous review and revision of the programs submitted in the annual summary. To provide for this situation, the operating divisions submit revised programs in the manner already described for regular programming. At the normal programming time each year, complete program outlines for the following two years, incorporating all revisions, are submitted

to enable management to reconsider approvals in the light of the current financial situation of the company and general economic conditions.

Essentially, the capital expenditure program summaries and revisions provide a basis for broad operating and financial planning. The permanent property requisitions serve as a review and basis of control over actual expenditures. These requisitions must be prepared and approved before any commitments are made for capital expenditures. The requisition serves to identify the expenditure in terms of its specific items which, of course, may vary from the content of the program as originally submitted. The requisition provides the final evaluation before money can be spent. Also, it serves to identify any equipment obsoleted and indicates its value and method of disposal. Many times one permanent property requisition will cover a group of related individual items, or even all the items involved in a particular program. The method of processing requisitions depends upon the size of expenditure. Naturally, executives at the corporate level should not spend time reviewing individual requests for which the amounts involved are not substantial. The cut-off point for division versus corporate approval has to be established somewhat arbitrarily. In Sylvania, we use dollar limits for approval at three levels: division manager, corporate officers and finally the board of directors. In no case, can items covered by a permanent property requisition be changed without resubmission for review and approval. Also, the estimated cost can not be exceeded by more than ten per cent without resubmission. Any overrun of $5,000 or more regardless of the percentage involved, requires the same approval as the original.

Progress Reporting, Availability of Funds, Follow-up of Projects

Next, to tie all the pieces together and to review the overall activity, each division prepares a monthly report on division expenditures called permanent property program detail. (Exhibit 5). It summarizes program authorizations, permanent property requisition approvals, expenditures, and unexpended funds. The division schedules are consolidated to provide a company-wide summary which is included in the monthly financial statement book for top management. This summary shows rate of cash authorizations, commitments and expenditures or, in other words, the overall progress in carrying out the capital expenditures plan. Finally, our system of controls would not be complete without a reliable method of determining the amount of capital currently available for investment and what can be anticipated in the months ahead. Therefore, we instituted a cash forecast report, the form of which is illustrated by data on capital expenditures program (Exhibit 6) and the purpose of which is to provide our financial

DATA ON CAPITAL EXPENDITURES PROGRAM

Program Title: Program No. _____

Purpose and Description of Program: Priority Rating _____

Anticipated additional earnings or savings:

Program is estimated to start: _____ Program is estimated to be completed _____

CASH REQUIREMENTS

Year	Capital Amount (a)	Expense Amount	Working Capital	Program Total
1955				
1956				
Total				

Capitalized against program in 1954 *:			$
Requisitions already officially approved for program and still open**:			$
Expenditures against these requisitions *:	1955		$ 1956
Cash needed for these requisitions:	$		$
New cash for capital requisitions:	_____		_____
Total Cash for capital requisitions (a):	$		$

(a) Each year amount in both places must agree. *Estimate as of 12/31/54. **As at date of submitting budget.

EXHIBIT 6

staff with this information far enough in advance to permit sound planning. It informs management of the current estimate of cash availability versus expenditure requirements. On the basis of this comparison, action is initiated to obtain additional cash, or to ration cash outlays or step up investment plans, as the case may be. Short-term forecasts are submitted by each division, each month, indicating future requirements by months up to twelve months. Long-term forecasts supplement the short-term by projecting cash availabilities three years ahead. These are prepared annually. Essentially, the cash forecast balances anticipated disbursements against estimated receipts but entries on the cash forecasts report for permanent property outlays are made only on the basis of permanent property requisitions which have been approved. Thus, central management can use the forecast as a starting point in measuring the impact of additional capital expenditure approvals on our cash position. And, of course, whenever the forecast indicates an impending cash shortage position, expenditure approvals can be slowed down or plans can be made for additional financing, far in advance of requirements. In this respect, the cash forecast has been of enormous importance to the maintenance of our forward drive.

There remains one other important phase of the subject of capital expenditures. This is the follow-up-appraisal or post audit. As a part of our controls system, we have made provision for follow-up of programs to assure results as originally proposed. This is important for a number of reasons. Foremost is

the need to develop and maintain a high sense of responsibility among those submitting capital expenditure proposals. This can be assured by the knowledge that a follow-up will be made. Also, we have learned a great deal by comparing results against the plan and have applied this knowledge in formulating later projects. For example, it may be found, on examination of a proposal, that all the facts are clearly and thoroughly supported and that the return on investment is projected at an extremely satisfactory level. However, on post-audit of the program, it proves to have been unsatisfactory because the high annual return on investment extended over only a short number of years, after which equipment became obsolete. It is extremely important to maintain awareness of this possibility and, by review after the fact, to keep informed of its frequency of occurrence.

In Sylvania, the follow-up takes the form of internal auditing and repetitive and special analysis. Up to this point, I have said nothing about the role of our internal auditing processes. Our internal auditing department operates independently of any division or plant personnel and, broadly stated, its function on this subject is to see that specific policies established by the company have been adhered to with regard to all capital expenditures. Particular emphases are placed on the determination that competitive bids were obtained before expenditures were made; that proper accounting for capital versus expense items, including installation and other costs, was made; that correct asset classifications and depreciation rates were used; that the disposition of obsolete equipment was made in accordance with company policy (accounting, competitive bids, etc.); and that approvals for expenditures were obtained in all instances, particularly in the instance of expenditures in excess of the original approvals. The internal auditing function also includes a post audit of investment profitability when new plant, new equipment, or replacement equipment is in full operation. This audit phase includes the comparison of projected versus actual figures. The investment for plant, equipment and working capital items are examined and compared with the projected amounts, but this is not a major responsibility.

As a part of our regular analysis activity, the local management naturally continually measures the profitability of its operations. Special attention is directed to recent plant changes and additions. Usually this type of analysis takes place soon after the new facility commences operation. As an example, the Lighting Division recently opened a new plant in Winchester, Kentucky in connection with our Photoflash operations. This plant promised to improve our efficiencies and handle considerably increased volume. We wanted to make sure that the Winchester plant fulfilled expectations and, if not, we wanted to know why and take action accordingly. Therefore, one month later we began to re-

view, analyze and investigate very closely the regular monthly statements from this operation. This does not mean that top management examined detailed reports on internal plant operations. It does mean, however, at both corporate and divisional levels, that we watched trends on the key factors (cost, return on investment, investment turnover, and earnings), as compared to the standards established when the project was approved. These investigations are made each month until it is certain that the investment profitability will be realized as originally projected or until other corrective moves are indicated. With the exception of the internal auditing processes, the follow-up procedures are conducted entirely within the framework of our decentralized organization. Division management in most instances provides the basic data from which the special analyses are made and division and plant management is encouraged to develop its own analysis program.

The Ends in View

The contents of this article, largely a case study, have been about equally divided between consideration of policies which relate the purposes of capital expenditures to the conduct of capital expenditure programs and particularization of the accounting tools through which an individual company in a fast developing industry gives effect to these policies in pursuit of increased profitability of operations in the near and not-so-near future. It will have been noted that, although the application incorporates certain mechanics, i.e., procedures, it is not mechanical in character, but rather flexible and adaptable and, above all, responsive to managerial needs and changing circumstances.

Standard Costs for Small Business

by LINDEN C. SPEERS

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Calling attention, in specific terms, to the role of management in developing a standard cost method, this article provides both a framework within which standard costs must be applied and an illustration of a standard cost method for small business. The excellent narrative description of a standard cost method which follows the background information on the advantages and possibilities of standard costs, is supported by itemized lists and diagrams, which further clarify and explain the possibility of adapting standard costs to the small firm.

THE QUESTION OF STANDARD COSTS for the small business has been with us for some time. Sporadic articles have appeared on the subject but few attempts have been made to provide an overall approach to the problem. It is the objective of this article to provide such an examination. Specifically, the purpose of this paper is the presentation of a philosophy of standard costs in the language of small business and the description of a standard cost procedure adaptable to small business. Both phases need to be covered for there seems to exist a tendency for a sizeable segment of the management of small business, including the accountant, to associate standard cost methods with complex procedures and suitable only for large firms. They fail to recognize that a modified approach would accomplish about the same end result for small business. In this context, the first part of this paper is directed to the overall problem of standard costs for small firms. Following this a standard cost procedure for small firms is presented to indicate the practical application of the overall philosophy.

Nature of Standard Costs for the Small Firm

The very small business is operated by the fingertip control of the owner because he can retain essential data in his mind and can observe undesirable developments. It is when the business grows and it becomes necessary to delegate authority and responsibility for the performance of management functions that the need arises for some of the controls afforded by sound standard cost accounting principles. The major aids of standard cost accounting procedures to management may be summarized as providing (1) a means for measuring and con-

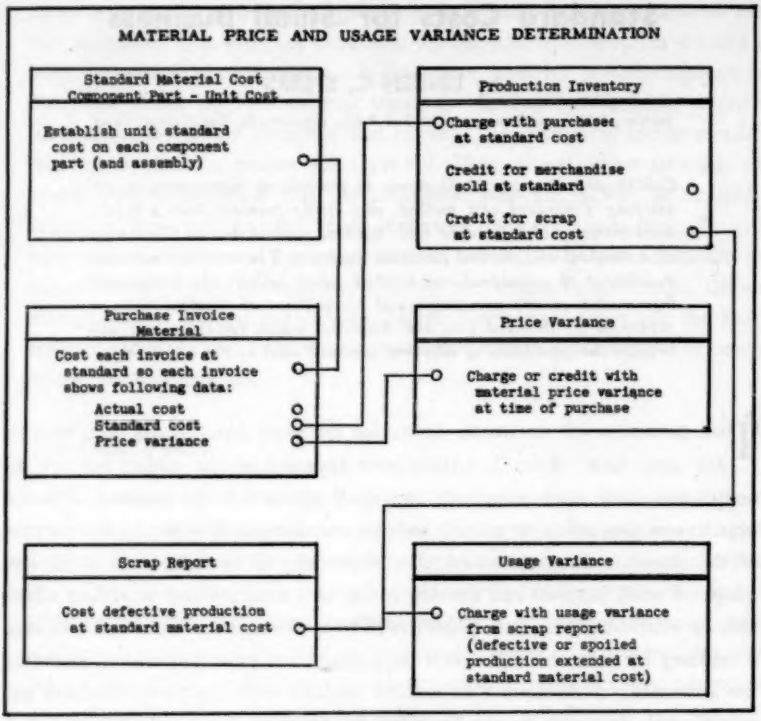
MATERIAL PRICE AND USAGE VARIANCE DETERMINATION
Standard Material Cost
Component Part - Unit Cost
Establish unit standard cost on each component part (and assembly)
Production Inventory
Charge with purchases at standard cost
Credit for merchandise sold at standard
Credit for scrap at standard cost
Purchase Invoice
Material
Cost each invoice at standard so each invoice shows following data:
Actual cost
Standard cost
Price variance
Price Variance
Charge or credit with material price variance at time of purchase
Scrap Report
Cost defective production at standard material cost
Usage Variance
Charge with usage variance from scrap report (defective or spoiled production extended at standard material cost)

EXHIBIT 1

trolling costs (2) a practical method of valuing inventories, (3) a consistent and stable basis for establishing realistic selling prices, and (4) an accounting method which will promote promptness in the preparation of cost reports for management. For the small firm this suggests a costing method which will permit preparation of reasonably correct monthly reports. This means, among other things, finding a method whereby production can be costed in and out of inventory at the same value. It is not so important that the unit costs be minutely correct so long as they are reasonable. The more advanced techniques of computing more exact costs may be deferred until the size of the company and other factors warrants its use. By way of illustration assume a manufactured part has an actual cost of 50 cents but an estimated cost of 45 cents. It takes little mental computing to see that, for monthly reporting of operations, it would be much better to put the respective part into inventory at the estimated unit cost (standard) of 45¢ per unit and relieve the inventory at 45¢ per unit when sold than it would

be to charge the actual cost of 50¢ into inventory and then relieve the inventory at 45¢ per unit. Under the first method the variance between actual and estimated (or standard cost) is reflected each month in the operating statement. Under the second method, there would be an unfavorable variance buildup in the inventory until the year end when a physical inventory was taken. This alone suggests the need for a small business to set the best standards possible under the circumstances but to use standard costs.

The steps which need to be taken by the management of small business (including the accountant) to enter into a successful venture with standard cost accounting are:

1. Acquire through self-education an understanding of the purposes and advantages of standard costs
2. Develop standards, even if rough estimates must be used to start, for the purpose of obtaining workable monthly reporting.
3. Refine the techniques of setting standards and expand the standard cost system commensurate with the development of the company.

Suitable Material Standards

The material standards for the small firm should be set at the best estimate of the actual quantities that will be used and the best estimate of the actual prices that will be paid for material. Actual prices paid for materials naturally will vary from standard prices and will result in an accumulative price variance (over or under standard) for each month, as materials are purchased. While the material price variance should be determined at the time the purchase invoices are processed, the variance may be reflected in the operating statement either at the time of purchase, or at the time of sale (of the manufactured product). More than one material inventory and material variance account may be set up if there is a practical advantage in knowing the inventory values and the variances by more than one classification.

Whether price variances will be considered an expense at the time of purchase or at the time of sale will probably depend upon the expected effect upon the operating statement. As illustrated in the table below, an even flow of purchases under Method 1 (variance expensed at time of purchase) would result in a relative even amount of variance, whereas irregular purchases would result in irregular charges or credits to variance.

DAILY TIME CARD

Part No.	Prod. Class	Wage Rate Class	Actual Hours	Quant.	Std. Quant. Per Hour	Standard Hours
	100	1	4.0	90	20	4.5
	200	2	4.0	80	25	3.2

EXHIBIT 2

METHOD 1

Charge or Credit Variance to Operations at Time of Purchase

Example of Even Flow of Purchases			Example of Irregular Flow of Purchases		
Mo.	Standard Cost	Variance	Mo.	Standard Cost	Variance
1	$6,000	$ 360	1	$18,000	$1,080
2	6,000	360	2		
3	6,000	360	3		
4	6,000	360	4	18,000	1,080
5	6,000	360	5		
6	6,000	360	6		
		$2,160			$2,160

If the pattern of purchases indicates the advisability of reflecting the variance under Method 2 (at the time of sale of the manufactured product), the price variance, determined when the material is purchased, will be carried in an inventory price variance and will be considered a part of the inventory until transferred to an operating price variance account. The monthly transfer from the inventory variance to the operating variance accounts may be done on a first in first out basis, computed as a percentage of the standard material cost in cost of sales. Material usage variance can be determined by accounting for spoiled production (scrap) at standard price.

Exhibit 1 summarizes, in diagrammatic form, the accounting for material costs, under a standard cost method for the small firm. While the individual component part was used as an example, raw material would be handled in a similar manner.

Direct Labor Standard Costs Method for the Small Firm

Direct labor standards should be set at the best estimate of the actual time required by operations and the best estimate of actual wage rates. Much latitude

is open in determining the time and rate factors. The rate factor should represent a standard wage rate class for the type of operation. For example, the wage rate classes, based upon pay scale, might be as follows:

Class	Standard Wage Rate	
1	$2.00 per hour	Represents
2	1.75 per hour	an average
3	1.50 per hour	by groups

These wage rate classes should be identifiable by machines, operations, or men. It is almost uncanny how steady these average rates within a group remain and the rate variance resulting from using this approach is generally minor.

There may be some direct labor work on which it is considered impractical to set standards. This type of labor would be considered direct labor not on standards and would in effect be charged direct to cost of sales and would not go through the production inventory labor accounts. The method of accounting for this kind of direct labor will be explained later. The first problem in connection with labor cost is the determination of actual direct labor cost in a manner that can be correlated with the computation of standard direct labor cost. The shining light in this entire article is the work saving features (simplification) of accounting for labor costs. Both actual and standard labor production costs are determined in terms of hours by wage rate classes and no conversion to dollars is required until the pay period for actual costs and the monthly closing for standard costs and variances. The usual type of daily time card (direct labor) can be used for reporting production. In addition to showing the conventional data of man name, number, and department, part number, machine number, elapsed time, operation number, account number for indirect labor, and similar information, it should provide for recording the data shown in Exhibit 2.

The daily processing of the daily time cards is entirely on the basis of hours. A weekly payroll card can be used for simultaneously accumulating hours for payroll purpose and for standard cost purposes. An example of the weekly payroll card is shown in Exhibit 3, and illustrative figures have been written in to show the workings of the card.

On the weekly payroll card four columns are headed Product Class 100, 200, 300, and 400. The purpose of these columns is to provide for maintaining separate inventory control accounts between major product classes and to determine the costs and variances by product classes. More than one column (classification) can be maintained on indirect labor if desired. The total actual hours are posted daily in the appropriate product class of the weekly payroll card from the daily time card or cards, if more than one is used by a workman. For convenience in the subsequent processing, a separate "daily time card" should be used for each

WEEKLY PAY ROLL CARD

Employee — Week Ended

Accrual Amount	Product Class				Ind.	Hours	OT	Wage Rate Cl.	Actual Rate
Date	100	200	300	400	Labor	Worked	Hours		
M	8					8			
T	6				2	8			
W	6				2	8			
T	5				4	9	1		
F	8					8			
S									
S						Straight time			
Total Hours	33				8	41	1	Total Earnings	Comb. Tax
Amount	69.30				16.80	86.10	1.05	87.15	
1	2	3	4	5	6	7 8	9	10	11

EXHIBIT 3

product class. As indicated at the bottom of the weekly payroll card it is used for determining total earnings at the end of the pay week and subsequently the writing of the payroll check. The total hours on the daily time card should be checked against the hours on the employee attendance cards. It is not absolutely essential to use a weekly payroll card as the daily time cards can be accumulated and summarized at the end of the pay period. However, utilization of the weekly time card will probably speed up the payroll preparation at the end of the pay period. Also, it provides a convenient method of accruing the payroll dollar cost for the monthly closing when the monthly closing and pay period do not coincide.

After being posted to the weekly payroll cards the daily time cards will be processed further (daily) to provide data for production inventories and variances and should be sorted as follows:

Sort 1 (all cards)	Sort by direct and indirect labor
Sort 2 (Direct Labor Cards)	Sort by product classes
Sort 3 (Direct Labor Cards)	Sort by direct labor on standards and not on standards
Sort 4 (Direct Labor Cards)	Sort by wage rate classes

After Sort 4, totals may be run on the actual hours for each day for each of the respective categories and posted to an Actual Direct Labor Hours Summary (Exhibit 4) for weekly summarization and proof.

For daily proof purposes total hours are added for each labor category on the weekly payroll cards and balanced to the respective totals on the actual direct labor summary. The purpose of the "actual direct labor hours summary" is to

provide, for those direct labor hours on standards, control totals expressed in terms of hours on production which can be used in computing the performance or efficiency variance. Since direct labor not on standards has no standard measurements for determining values to be charged into and out of inventories, it should be charged directly to cost of sales or a variance account if desired. The relative amount of direct labor not on standards to total direct labor should be small. One exception to this might be a type of labor considered direct for some special reasons of a particular company but which in the general sense of the term is a type not properly chargeable through inventories.

As mentioned previously, the weekly payroll card is used for determining total earnings at the end of the pay week. Reference to the card shows that it is designed to compute straight time earnings for each direct labor classifications (and indirect labor). At the end of each pay week, after the earnings computations have been completed, the labor cost by classifications are totaled from the weekly payroll cards and posted to a Labor Distribution Journal (Exhibit 5). In this journal the actual direct labor costs by direct labor classification (product classes) are collected by months. It should be mentioned that if any detailed breakdown is desired on indirect labor in excess of that available from the weekly payroll card, it may be obtained from a further sorting of indirect labor "daily time cards" by account number, machine number, and similar classifications. Instead of extending each indirect daily time card by the individual employee rate, predetermined wage rate class rates should be used to extend the total hours for the month (by class) for each expense account.

Up to this point, we have concerned ourselves with actual hours and cost. It is now necessary to revert to the daily time card which is the source for computing production at standard and, as previously stated, production is to be computed in terms of standard hours. Since the daily time card provides for showing both standard hours and actual hours, standard hours for each operation must be computed by dividing actual quantity by standard quantity per hour. After all of the cards are processed and standard hours determined, they are summarized by totaling the standard hours by wage rate class for each product class and posted to a standard direct labor hours summary. (Exhibit 6.) The hours are posted daily and accumulated for the months production. The total hours in each product class extended by the respective standard wage rate class gives the standard direct labor cost of production for the month which is charged into production inventory.

An extremely effective performance report can be prepared daily from the

ACTUAL DIRECT LABOR HOURS SUMMARY

	Prod. Class 100						Prod. Class 200						Etc.
	On Stds. Wage Class			Not on Stds. Wage Class			On Stds. Wage Class			Not on Stds. Wage Class			
Day	1	2	3	1	2	3	1	2	3	1	2	3	
M	30	23	27	4	2	2							
T	31	26	22	3	3	1							
W		↑ Actual hours											
T													
F													
S													
S													
Total													
Month Total	600	420	380	38	27	21							

(Hours on standards for month are extended at standard wage rates. --Charge difference between this total and standard cost (Exhibit 6) to performance variance and credit direct labor clearing account.)

(Hours not on standards for month are extended at standard wage rates and charged to cost of sales or variance accounts and credit direct labor clearing account.)

EXHIBIT 4

daily time cards. While not necessary to the cost accounting function, it is an additional tool for management and all companies who have passed beyond the embryo stage of growth and existence should consider its use. It is the per cent of efficiency of actual production to standard production. It can be determined for each employee by dividing standard hours by actual hours and multiplying the result by 100. Or the performance results can be expressed in terms of gain or loss in dollars by multiplying the difference between actual hours and standard hours by the standard wage rate class for the employee. If only total daily performance gain or loss in dollars is desired, this can be computed by multiplying the difference between total actual hours and total standard hours for all of the cards in each standard wage rate class by the rate for that class. The two variances relating to direct labor are wage rate variance and performance variance. The summarization of hours, as outlined, readily permits the computation of these two variances. The wage rate variance is the difference between the actual direct labor cost and the sum of the actual hours, by classes, for the month, multiplied by respective standard wage rates. The performance or efficiency variance is the difference between the sum of the actual hours by classes multiplied by the respective standard wage rates (same computation as made for wage rate variance) and the sum of the standard hours by classes, multiplied by the respective standard wage rates.

LABOR DISTRIBUTION JOURNAL

	Direct Labor				Indirect Labor
	Prod. Class 100	Prod. Class 200	Prod. Class 300	Prod. Class 400	
1st Week	$ 1200.00	$ 735.40			
2nd Week					
3rd Week					
4th Week					
Ending Accrual	420.00				
Less Beginning Accrual	(350.00)				
Actual labor cost for month	$ 5120.00	$ 4032.00			

(This is the actual cost of direct labor computed by summarizing the weekly pay roll cards -- charge to direct labor clearing account.)

(Charge difference between total actual direct labor cost per this exhibit and total labor cost Exhibit 4 (Labor on standards and labor not on standards) to wage rate variance and credit direct labor clearing account.)

EXHIBIT 5

Summary of the Direct Labor Standard Cost Method

The method of accounting for direct labor, under a standard cost procedure may be summarized in the following manner:

1. Establish standard time for performing each direct labor operation.
2. Establish standard wage rate classes for representative pay range groups.
3. Establish standard (direct) labor cost for each operation based on 1 and 2 above.
4. Use daily time card for reporting production in terms of quantity and actual hours and compute standard hours for actual production.
5. Post actual hours by product class to weekly payroll card to enable computing earnings for pay checks and to provide information for the labor distribution journal. This will reveal actual direct labor cost by product class and indirect labor costs for the month.
6. Post daily actual hours by product classes and wage rate classes to actual direct labor hours summary. Add columns for monthly totals and extend at appropriate standard wage rate class to compute cost of actual hours at standard wage rates for labor on standards and not on standards.
7. Post daily standard hours by product classes and standard wage rate classes to standard direct labor hours summary. Add columns for monthly totals and extend at appropriate standard wage rate class to compute standard direct labor cost (standard hours at standard wage rates).
8. The method of computing the monthly inventory entries and variances are as follows:
   a Actual payroll—Charge actual payroll, item 5, to a direct labor clearing account.

STANDARD DIRECT LABOR HOURS SUMMARY

	Prod. Class 100			Prod. Class 200			Prod. Class 300			Prod. Class 400		
	Wage Class			Wage Class			Wage Class			Wage Class		
Day	1	2	3	1	2	3	1	2	3	1	2	3
M	25	20	22	Etc.								
T	27	18	20									
W												
T												
F												
S												
S												
Total												
Month Total	575		405	360								

↑ Standard Hours

(Standard hours extended at standard wage rates gives standard direct labor cost of production -- this is charged into production inventory and credit direct labor clearing account.)

EXHIBIT 6

b Standard cost of production—Charge standard labor cost, item 7, (standard hours at standard wage rate) to production inventories by product classes and credit direct labor clearing account.

c Cost of direct labor not on standards — Charge labor cost not on standards, item 6, (actual hours at standard rates) to cost of sales and credit direct labor clearing account.

d Performance (efficiency) variance—Charge difference between labor cost on standards, item 6, (actual hours at standard rates) and standard labor cost, item 7, (standard hours at standard rates) to performance (efficiency) variance and credit direct labor clearing account.

e Wage rate variance—Charge difference between total labor cost on standards and not on standards, item 6 above, (total direct labor actual hours at standard rates) and the actual direct labor cost, item 5 above, to wage rate variance, and credit direct labor clearing account. This entry should close out the direct labor clearing account with the exception of the odd penny differences which should of course, be closed out in this entry.

Standard Costs for Manufacturing Overhead

This paper has been limited to a discussion of material and labor costs. The problems involved in accounting for and controlling overhead, in any refined sense, are in themselves a major subject. However, for the purpose of a starting point in developing standard cost method, it should be sufficient to charge manufacturing overhead into the production inventory accounts at an estimated (standard) rate on standard direct labor cost. It is suggested that separate pro-

duction inventory accounts be maintained for manufacturing overhead following the same breakdown as for direct labor. In this manner, the overhead in inventory can be readily adjusted if too large a difference develops between the actual and estimated rates. The difference between the actual overhead and the overhead absorbed at the estimated (standard) rate will be charged or credited to overhead variance accounts.

Recapitulation

This paper lays out an idea which is a start in the thinking of small business in the use of standard cost accounting. The first step is the most important step, so take a practical simple step. Set material and labor standards in the beginning stages at the best estimate or measure which is practical within the given company. Grow step by step from a very simple beginning. Do not try to jump from the ground to the top of the ladder. More ventures into system revisions have been abandoned because too big a change is made in the beginning. Both management and employees become discouraged by the flood of work and cost of drastic changes.

It should be remembered that the plan illustrated herein is a rough plan, but this is generally the starting point for the small business segment of industry. Further, it should be remembered that a practical standard cost accounting system will generally resolve the paramount problem of reliable monthly operating statements for small business.

Project Costing in a Research Laboratory

by A. J. GALLANTIER

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This description of a procedure for accounting for projects within a research department in such a manner as to reveal information useful for management has current interest in that many companies are newly emphasing the research function. The reader is carried through the procedure by means of illustrations. Underlying it is a philosophy looking toward improvement of accounting for management purposes with research project cost accounting serving as an example of application of this philosophy.

THE FUNCTION OF ACCOUNTING is slowly but assuredly gaining a place of importance with top line management. This is no coincidence or accident, but rather a result of management recognizing the value and benefits supplied by the accounting profession in serving as a valuable device of management as well as an indispensable safeguard of stockholders. One development evidencing this growth is project cost accounting. It is the purpose of this article to outline, in a simplified manner, the techniques employed by Socony-Mobil in their research laboratory for recording and stating business transactions as they apply to specific projects.

Objectives of Project Cost Accounting

Our objectives in setting up the project cost accounting procedure for Socony-Mobil were as follows:

1. To aid management in regulating project costs and effecting cost reductions.
2. To satisfy the requirements of special committees in considering the costs of projects falling within the scope of their interests.
3. To satisfy the requirements of public auditors where billing for services is involved.
4. To effect the correlation of project cost reports and project budget presentation.
5. To improve the accuracy of the cost data compiled.
6. To establish a uniform procedure of determining and reporting laboratory costs.
7. To expedite the summarization of project costs thru the use of tabulating equipment.

Before listing these objectives in a decisive manner management was consulted to determine their "foremost" requirements and their suggestions were included in the objectives and enabled a determination of the degree of accuracy needed in reports.

Distribution of Labor and Overhead to Projects

In order that total laboratory costs may be included in all active projects, accounting techniques clearly defined and properly coded, must be developed in some detail. The distribution of labor and overhead is the key to the project cost accounting system for the research laboratory at Socony-Mobil. This is so because experience over a period of many years has proven it impractical to charge out to specific projects the value of material and supplies. Consequently, the following principles of distribution were formulated and approved:

1. The general principle of the project cost accounting procedure is that all direct project labor, including that of service departments, should be charged to the specific project receiving the benefit of such labor.
2. All other labor of a nature that benefits more than one specific project, including indirect overhead, should be equitably spread over all projects.
3. The cost of material, supplies and equipment may be charged direct to projects or pro-rated, according to the policy of the laboratory considering the problem. The type of material and equipment purchased for general research work is so interchangeable, however, that direct cost accounting could very easily prove more burdensome and costly than the benefits to be derived from such a procedure. Consequently, we have elected to pro-rate this type of cost.
4. Appropriation costs applicable to specific projects should be charged to projects receiving the benefit of such work. All other construction costs should be charged to overhead and pro-rated equitably over all projects.
5. The method of distributing overhead and other pro-rated charges must rest with the appropriate level of management responsible for the unit. The research and development department management has approved a procedure whereby laboratory overhead is distributed to project sections on a percentage of manpower in each section as against the total project manpower in the laboratory.
6. In turn, section overhead is pro-rated to projects on a percentage of project man hours worked.
7. Service groups such as machine shops, carpenter shops, pipefitters, insulators, painters, analytical groups, performing duties of a general nature, should charge their time to the groups who originated the work requisitions.
8. Service groups performing duties of a plant maintenance and repair nature should charge their time to general overhead.
9. Administration, office, cafeteria, industrial relations, library, safety and fire prevention groups should charge their time to general overhead, since their services are all-inclusive and applicable to all departments.

Collection of Labor Time Information

The original source record for project cost accounting purposes is the time distribution record. This record may be in the form of a daily, weekly, bi-weekly

DAILY TIME DISTRIBUTION SHEET

RESEARCH & DEVELOPMENT DEPARTMENT

PROJECT COST ACCOUNTING

Month: January 1953

Section: Research

Technical ☐ Check
Non-Technical ☐ One

The following codes to be used for absences:

550 - Holidays
551 - Sickness
552 - Vacation
553 - Other Paid Absence

ACCOUNT CODE	PROJECT	ACTIV-ITY	PROD-UCT	ASST. SECT.	TOTAL	1	2	3 Saturday	4 Sunday	5
550	0000				8	8				
400	1051	10	20	30	32		8			
400	3083	20	30		104					8
400	2039	20	30	30	32					
GRAND TOTAL					176	8	8			8

EMPLOYEE'S NAME John Doe BADGE NO. 5000

EXHIBIT 1

or monthly time sheet, depending upon the payroll periods in the organization. The research laboratory uses a weekly time record for employees on the bi-weekly payroll, in order to spread the work load for the tabulating group and a monthly time sheet for employees on the monthly payroll. The monthly time distribution sheet must be submitted by every employee on the monthly payroll in order to balance out with payroll control figures. Secretaries prepare and submit time data sheets for line management while supervisory personnel are authorized to charge their time to their respective plant or section overhead. All other employees are required to follow the coding system outlined in the chart of accounts or project list. Exhibit 1 shows the major portion of the daily time distribution sheet employed in our procedure at Socony.

Employees on the bi-weekly payroll record similar information on weekly tabulating cards, from which the tabulating group key punches the data. These employees record all hours paid during the period covered by the payroll distribution card. Since the project cost data is accumulated on a calendar month basis and the payroll prepared on a bi-weekly basis, and in view of the fact that the weekly time distribution card is used to accumulate the required information for accounting, project cost work and bi-weekly payrolls, it is often necessary to use two sets of weekly payroll distribution cards in the last week of

each month to take care of accrued payroll when the last day of the month does not coincide with the bi-weekly payroll period.

Time distribution is recorded in tenths of hours and separate entries are made for each different charge and for rates of pay other than basic. Hours worked overtime by employees subject to the wage and hour laws are recorded on the weekly payroll distribution record by showing the actual hours worked plus premium time. All weekly payroll distribution cards are checked against the weekly time cards each week for the preceding period under review in order to make certain that total hours for each record are in balance. During this checking process, the payroll group is responsible for inserting rates other than basic such as shift differential and temporary rates. All weekly time distribution cards are checked by a delegated responsible employee for the verification of the accuracy of project, activity, product and overhead charges. The work is staggered in order to spread the work load in the tabulating department.

The heart of the tabulating system is the punched card which receives numerical characters that eventually interpret all the facts and figures, the ultimate product of the procedure covered in this presentation. It is important, therefore, that a comprehensive and systematic tabulation of all applicable codes be prepared in manual form and distributed to all employees who will have occasion to utilize the coding system.

Determining an Adjusted Labor Rate to Cover Overhead

The objectives of the project cost accounting have been discussed and the basic data that must be included in the punched card has been indicated. At this point an attempt will be made to connect the data that has been manually applied to the weekly payroll distribution card and the monthly time distribution sheet to the actual tabulating operation and the final printed result.

At the beginning of each week, as well as at the start of each month, all time distribution cards and sheets for the previous periods are collected and turned over to the tabulating department where they are put through the sorter and classified according to the method of distribution and account codes. The tabulating group then makes a run of laboratory overhead, section overhead, outside charges for billing purposes, appropriation charges and project charges. This run, in multiple copies, indicates the working group, the group receiving the charge, account code, technical and non-technical hours and technical and non-technical cost. The cost is calculated from actual payroll rates on file with the tabulating section. The basic run is then submitted to the accounting department where it is used as a work sheet in calculating the adjusted hourly rates

STEPS IN DETERMINING ADJUSTED LABOR RATE

Step #1 - PROJECT HOURS AND COST

1	2	3	4	5
Sect.	Technical Hours (From Tabulating Run)	Technical Cost (From Tabulating Run)	Non-Technical Hours (From Tabulating Run)	Non-Technical Cost (From Tabulating Run)
10	1,000	4,104.50	400.8	1,048.40
20	5,000	18,102.50	10,000	23,675.00
30	3,500.5	11,872.29	8,000	18,947.20
40	700	2,707.46	7,000	16,602.60
50	4,000.5	14,580.22	3,090	6,601.20
Total	14,201	51,366.97	28,400.8	66,874.40

Step #2 - SECTION OVERHEAD

Sect.	Technical Cost (From Tabulating Run)	Non-Technical Cost (From Tabulating Run)
10	1,122.	175.
20	6,000.	3,900.
30	4,000.	3,000.
40	900.	2,500.
50	5,100.	1,000.
	17,122.	10,575.

STEP #3 RECONCILIATION OF LABORATORY OVERHEAD

Laboratory Expense			290,000.00 From Gen. Ledger
Plus: Service Income - Ref. 1	3,000.00		
" " 2	1,000.00		
" " 3	500.00		
			4,500.00
			294,500.00 Gross Cost
Less:			
Proj. Labor Tech	51,366.97	Col. 3	
" " Non-Tech	66,874.40	" 5	(118,241.37)(Col. 3 & 5)
Sect. Overhead Tech	17,122.00	" 6	
" " Non-Tech	10,575.00	" 7	(27,697.00)(Col. 6 & 7)
Spec. Expense Appro.	1,000.00		(1,000.00)(Appro. Ledger)
Lab. Overhead			147,561.63 (Carried to Total of Col. 13)

Step #4 - BREAKDOWN OF TOTAL LAB. OVERHEAD TO EACH SECTION

10	11	12	13
Sect.	Project Manpower	% Project Manpower (From Col. 11)	Lab. Overhead (Total x 12)
10	11	3.74	5,518.80
20	105	35.71	52,694.26
30	80	27.22	40,166.28
40	78	26.53	39,148.10
50	20	6.80	10,034.19
Total	294	100%	147,561.63

Step #5 - BREAKDOWN OF TOTAL LAB. OVERHEAD TO EACH SECTION BY TECH AND NON-TECH COST

14	15	16	17	18
Sect.	Total T & Nt Proj. Hrs. (2 ÷ 4)	% Tech Hrs. (2 ÷ 14)	Tech Cost (13 x 15)	% Non-Tech Hrs. (4 ÷ 14)	Non-Tech Cost (13 x 17)
10	1,400.8	71.39	3,939.87	28.61	1,578.93
20	15,000	33.33	17,562.99	66.67	35,131.27
30	11,500.5	30.44	12,226.62	69.56	27,939.66
40	7,700	9.09	3,558.56	90.91	35,589.54
50	7,000.5	57.15	5,734.54	42.85	4,299.65
Total	42,601.8		43,022.58		104,539.05

Step #6 - ADJUSTED HOURLY RATES - TECHNICAL

19	20	21	22
Sect.	Project Hours (Col. 2)	Project Cost Sec & Lab Ohd (3 ÷ 6 ÷ 16)	Hourly Rates (20 ÷ 19)	Cost Using Adj. Hourly Rates (19 x 21)
10	1,000	9,166.37	9.1664	9,166.40
20	5,000	41,665.49	8.3331	41,665.50
30	3,500.5	28,098.91	8.0271	28,098.86
40	700	7,166.02	10.2372	7,166.04
50	4,000	25,414.76	6.3529	25,414.77
Total	14,201	111,511.55		111,511.57

RECAP OF ADJUSTED COSTS

Total Technical Cost	111,511.57
Total Non-Tech. Cost	181,989.22
Spec. Appro. Cost	1,000.00
Total Adjusted Cost	294,500.79

EXHIBIT 2

which include all direct and indirect project labor, all other labor, laboratory overhead, section overhead, taxes, insurance, labor burden cost and all other charges which must balance out to the total laboratory cost for the month under review as reflected in the accounting department's books.

The calculation of the adjusted hourly rates is somewhat complicated when a breakdown of the costs between technical and non-technical personnel is desired, which is the case in our laboratory. However, it is possible to outline the formula that closes the gap between the basic payroll rates, as taken from the original source record, the time distribution record, and the total cost of the unit's operation as reflected in the general ledger. Steps 1 to 6 of this calculation are shown in Exhibit 2. Step 1 reflects the basic tabulating run showing the direct hours and cost broken down by sections, technical hours and cost, and non-technical hours and cost.

Step 2 shows the section overhead, also broken down by sections and between technical and non-technical hours and cost.

Using the data in Steps 1 and 2, Step 3 is a reconciliation of laboratory overhead. From the general ledger, the total cost of laboratory operation for the period under review is picked up. To this is added the value of our service income account, in order to arrive at a gross cost of operation.

Total laboratory overhead cost is computed by deducting from the gross cost the sum of (1) the established project labor cost; (2) section overhead and (3) special expense appropriation cost, which is developed from the appropriation ledger. The net result of this reconciliation is the total laboratory overhead which must then be prorated to project groups.

Step 4 is a breakdown of total laboratory overhead to each section. The mechanics of pro-rating to sections on a percentage of project manpower is shown in this step in Exhibit 2.

Since separate costs for technical and non-technical personnel are maintained, Step 5 develops the percentages of technical and non-technical hours. In Columns 16 and 18 the total laboratory overhead for each section is multiplied by these percentage figures which gives us the technical and non-technical cost of laboratory overhead for each section.

Step 6 illustrates the computation of the technical adjusted hourly rates for each section. This is accomplished by adding the direct project costs, section overhead cost and the laboratory overhead cost for each respective section. Project hours are then divided into this total, the quotient being the adjusted hourly rate for each respective section. Exactly the same procedure as Step 6 is applied when non-technical costs are developed.

A recapitulation of total adjusted costs, as indicated at the lower righthand

PROJECT COST SUMMARY

RESEARCH AND DEVELOPMENT DEPT.

PROJ.	ACT.	PROD.	ASST. SECT.	TITLE	CURRENT MONTH PROJECT COST TECH. HRS.	NON TECH. HRS.	TOTAL HOURS	AMOUNT	ACCUM. COST YEAR TO DATE HOURS	AMOUNT
1051	10	20		Development Waxing Processes	50.5	25.1	75.6	638.	151.2	1276.
1052	90	10		Decolorization Studies	175.2	80.2	255.4	2168	510.8	4336.
1053	30	10		Crude Eval. Light Products	80.1	40.1	120.2	1015.	240.4	2030.
1054	30	40	20	Crude Eval. Lube Products	55.3	20.1	75.4	647.	150.8	1294.
1055	70	10	30	Motor Gas. Ignition Quality	300.0	100.1	400 1	3450	800.2	6900.
1056	70	40	30	Automotive Engine Oils	300.0	100.1	400.1	3450.	800.2	6900.
1099	00	00		Gen. Non-Project Activities	38.9	35.1	74.0	602.	148.0	1204.
				Total	1000.0	400.8	1400.8	11,969.	2801.6	23,940.

EXHIBIT 3

corner of Exhibit 2, shows that the totals for technical and non-technical cost, arrived at by multiplying total project hours for each section by the adjusted hourly rate for each section, plus the appropriation cost, amounts to the same figure taken from the general ledger as shown in Step 3. The small difference between the two figures is due to dropping or adding the fifth digit of the hourly rate. The accounting department then forwards the schedule of adjusted hourly rates for each section to the tabulating group. There these respective sectional average rates are applied to each group of punched cards and the final report for the period under review is printed on continuous master hekto carbon, from which the required number of copies are reproduced and distributed.

Preparing and Using Summary Information

The finished product of the procedure discussed here (Exhibit 3) represents a theoretical project cost summary. At the end of the year, total hours for each project are converted to man-years and this is used in reporting manpower and cost in our annual reviews. The completed summary is then distributed to supervisory technical personnel who use this report as a working record in the preparation of their project accomplishments and costs for the given period under review.

The utilization of tabulating equipment in the preparation of our summaries and reports provides the required flexibility in reporting costs by programs, departments, products, activities, or by any group that is represented in the cod-

ing system. Such flexibility would be impractical, and in many instances, impossible if the accumulation of cost data were on a manual basis.

Some years ago we enjoyed the simplicity of applying costs to projects through the medium of estimating manpower and multiplying this amount by the average technical and non-technical rates. For management review purposes and statistical requirements this method proved satisfactory. However, all good things inevitably come to an end and as the company continued to expand its activities, along with the fact that management started focusing a sharper eye on operating costs, considerable attention was directed towards a greater degree of accuracy in compiling cost figures, standardization of procedures and greater utilization of machine accounting. A complete study of our methods and procedures resulted in the adoption of the system now in use.

The project cost accounting system is not a simple one. It has its complexities and burdensome problems, such as education and the like, but it represents a happy medium in satisfying the requirements of management and conforming to sound accounting practices which are acceptable to outside auditors, and at the same time, avoiding the pitfalls of a costly accounting system that would involve the direct pricing of every nut, bolt and screw going into a specific project.

Product Costing to Support Price Differentials

by ROBERT G. TONE

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This paper concentrates on the difficult problem of developing product cost differentials—in respect, primarily, of selling, distribution and administrative expense—which will validly support differentials in prices, in the eyes of both management and regulatory bodies. There is outlined a procedure for gathering statistics and allocating costs so that meaningful reports can be rendered. Illustrative titles are used to clarify points made.

BUSINESSMEN ARE FINDING themselves forced to give more attention to their prices. They need a pricing structure which earns maximum profit yet complies with federal statutes. Of key importance in thinking on this problem is the view that the prices of each commodity should recover all costs, from manufacturing through distribution, and in addition return a reasonable profit margin. In a surprising number of cases some of the price brackets for a commodity may fail to recover all of the costs, let alone return a profit. To be sure of a reasonable profit margin, a proper cost structure is a necessary prerequisite to a sound price structure. In addition, the pricing structure becomes especially important to firms which sell goods of like grade and quality in interstate commerce but charge different prices to different customers. The Robinson-Patman Act forbids a company to discriminate among customers in pricing if the discrimination may injure or destroy competition. A part of the act (Section 2-a), however, permits the seller to justify this kind of pricing practice by "differences in the cost of manufacture, sale or delivery, resulting from different methods or quantities in which such commodities are to such customers sold or delivered."

While the need is great, the approach to be taken or the method to use in proper costing to support price differentials is relatively undeveloped. This article outlines steps for a continuing or periodic study of product price and cost relationships which can be used for this purpose.

Segregating Products into Price Categories

A company's published price lists usually show the list prices of its products and the discounts from list price which the company gives to volume buyers or to buyers on different levels of competition. However, this set of list prices and

discounts should be compared to the prices which each class of customer has actually paid. The comparison will show the degree to which actual selling prices correspond to published price lists and an appropriate classification into price brackets made. The breakdown into price brackets may be quite involved.

The product prices may vary between territories. If so, segregation should be made by territories. This should be done in order to determine the amount of price differential between the territories so the costs that prompted these price differentials can be matched with them. Also, the products or commodities of a firm may be segregated into homogeneous classes. In that event each class should be evaluated to determine its method of sale, the type of customer, and the degree of uniformity of the products within each class. If each of the product classes are sold in a different manner, separate cost allocations may have to be made for each. Also, if the customers who purchase one class of product are distinct from the purchasers of another class of product, it would be necessary to make proper segregations so that the related costs can later be measured in terms of the sales in each class. Further, the degree of uniformity of the products within each class should be determined. For example, assume the case of an appliance manufacturer who segregates his sales into several classes, one of which is air conditioning units. Assume further that a study of the type of air conditioning units in this class found that the class contained all types with a wide range of prices requiring varying methods of sale. Then it would be necessary to establish, perhaps, several classes or sales categories by type of unit. The cost segregations later made could be accurately appraised against each respective class. Another factor which must be considered and evaluated in defining the pricing structure is the degree to which the sales of one product in the product line depend upon the sales of a related product in the line. Finally, products should be analyzed according to the channels of distribution through which the commodities are sold. From an analysis such as this many price categories may be constructed and costs determined for each, as appropriate.

Gathering Statistics and Allocating Costs to Price Categories

The procedures presented for gathering the statistics on which costs are allocated are not intended to be all inclusive, but merely indicative of some of the accepted methods used. These procedures are the means by which costs are assigned to price bracket classifications or product classes. The statistics needed may vary with the problems peculiar to each firm and industry. But, in general, they are comprised of (1) salesmen's calls statistics, (2) order and invoicing

STATEMENT SHOWING COMPUTATION OF AMOUNT OF COST PER DOLLAR OF SALES

COMPANY_____ PERIOD_____

LINE NUMBER	DESCRIPTION	PRICE BRACKETS 1	2	3	4
1.	Sales at list price	$10,000.00	$20,000.00	$30,000.00	$40,000.00
2.	Costs applied	$15,000.00	$20,000.00	$20,000.00	$20,000.00
3.	Cost per dollar of sales	$ 1.50	$ 1.00	$ .67	$ .50

EXHIBIT 1

statistics, (3) time studies, (4) correspondence tabulations, (5) floor space measurements, and (6) asset valuations.

Salesmen usually report their calls daily or weekly. The call report should include the time per call as well as other pertinent information which will enable the office to assign the call cost. In addition to reporting calls made, each salesman should account for his indirect time, such as meetings and conventions, so that proper disposition can be made of this element of cost.

The order and invoicing statistics include the number of orders or invoices, the number of billing lines, and the number of invoice lines. Billing lines are the lines used on each invoice to record the items billed. The tabulation of the invoice statistics requires that each order first be coded to indicate its price bracket class. After coding, tabulation should be by customer by price class. The number of invoice lines is determined by multiplying the number of heading lines on an invoice by the number of invoices and then adding to this total the number of billing lines. The tabulation of heading lines on a representative number of invoices will determine the typical number of heading lines per invoice. The heading lines are the lines used for name, address, date, invoice number, and similar information. Time studies should be used wherever possible. The more common applications of time studies to this problem in accounting are on order picking and packing and salesmen's calls. Correspondence tabulations are made to determine the basis on which the costs of typing pools, filing personnel, etc., are assigned to the price brackets. The correspondence is first classified as to kind, customer, or subject matter, depending upon how the cost of this function is to be allocated. Then a representative number of pieces of correspondence is counted for each of the segregations. Weighting should be given, based on time studies, to the length of each letter or piece of correspondence. Floor space measurements should be made to arrive at the space occupied, first, by the major divisions or functions of the company. An "occupancy" cost per unit

of floor space is then computed and allocated to each function on the basis of units occupied by each. "Occupancy" costs will include rent, light, heat, depreciation, insurance, and taxes on the building, together with normal cost of maintenance and repair. The asset values of the office equipment should be determined as the basis on which the cost of this equipment is allocated to each function. First, an inventory is taken of all equipment and each item of equipment is classified into the function in which it is being used. Second, the asset value is assigned to each unit. The asset values in each function are then totaled, together with a grand total for all of the asset values. These values are then used to assign the costs which follow asset valuations to the respective functions.

Costs which normally vary with the quantities or methods in which commodities are manufactured, sold, or delivered can be segregated in three broad classes; namely, those which can be charged directly, those which can be readily assigned, and those which do not readily lend themselves to allocation. List separately the costs which can be charged directly to price bracket classification then assign them to their respective classes. Often, these will include cost variations in products, bad debt losses, and advertising allowances. Costs for which a factual and accurate method of assignment cannot be developed should be excluded from the study. The bulk of the costs allocated to price bracket classifications fall into the category which can be readily assigned. Generally, these will include all or portions of selling expenses, general and administrative expenses, warehousing expenses, and transportation and delivery expenses. Each of the detailed expenses within these groups should be analyzed and segregated into allocable appropriate categories. The degree of segregation will depend upon the content of each account and, of course, the refinement necessary for measuring the price structure. Further, every allocable cost should be sufficiently segregated to insure a high degree of correlation between the cost and the measuring statistic which is used to assign it.

The principal selling expenses are sales supervisory and sales office costs, compensation and expense of salesmen or representatives, and advertising costs. Each of these principal types should be divided into subfunctions so that a factual basis of allocation to price brackets or commodities can be made. The sales office costs may be analyzed to arrive at functional classes, like order handling, credits and collection, statistical, adjustments, etc. The cost of these classes would then be assigned to the price brackets classifications using the proper basis, such as number of orders, number of calls, and correspondence. The compensation and expense of salesmen should be determined individually so that the costs can be assigned separately. A division of the cost of each salesman should first be made according to the amount of time spent on calling

STATEMENT SHOWING PRICE BRACKETS, PRICES, COSTS, AND COMPARISON OF REDUCTIONS IN COST WITH REDUCTIONS IN PRICE FOR EACH SUCCESSIVE PRICE BRACKET PER DOLLAR OF SALES AT LIST PRICE

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Price Bracket Number	Price Scale	Cost	Cost Differential	Price Differential	Excess of Cost Differential Over Price Differential	Excess of Cost Differential Over Price Differential for Each Price Bracket		
						Price Bracket 1	Price Bracket 2	Price Bracket 3
1	$1.00	$1.50						
2	.75	1.00	$.50	$.25	$ .25	$.25		
3	.50	.67	.33	.25	.08	.33	$.08	
4	.40	.50	.17	.10	.07	.40	.15	$.07

EXHIBIT 2

or interviewing and other activities. This can usually be found by an analysis of the daily time reports or by a limited time study. The cost of calls should then be charged to their respective price bracket classifications. Advertising costs should also be analyzed by function, such as institutional, point-of-sale, and promotional. Certain portions, such as point-of-sale, may be applied directly to price brackets. Other segments of the advertising cost may have to be excluded unless of a type that can be factually related to price bracket classes. General and administrative expenses are composed principally of executive salaries and expenses, general office and clerical expenses, and miscellaneous expenses such as insurance, professional services, dues and subscriptions, allocable portions of "occupancy" expense, and office equipment expense. Each of these expenses should be analyzed and divided into subfunctions that can be assigned to the price bracket classifications or excluded. The subfunctions of office and clerical expenses may include general accounting, accounts receivable, accounts payable, general files, executive compensation and expense, and credits and collections. A selection of the proper basis of allocation should then be made so that each could then be assigned to price bracket classifications. Those costs for which a basis of allocation can not readily be developed would be excluded. The occupancy costs should be determined for each of the above subfunctions based upon the space each occupies. Occupancy costs thus determined for each should then be allocated to price brackets on the same basis as the subfunctions of general office and clerical expense. There is a relationship between certain general and administrative expenses and asset values of office

equipment. These expenses include depreciation, insurance, taxes, and maintenance costs chargeable to the equipment. Such expenses may be divided among the office subfunctions on the basis of the asset values of the equipment. Warehousing costs should first be classified into two primary groups, namely, stock handling costs and storage space costs. This broad separation should be made because the stock handling costs are closely related to the methods by which the products are handled, whereas the storage space costs are closely related to space occupied by each product. Each of the classes of warehousing costs may then be further divided into amounts applicable to finished goods and to raw materials and work-in-process. The stock handling costs can be segregated by time study, and the space costs can be segregated by space occupied. Each of the respective groups of cost are then assigned to price brackets or commodity classes on the bases of time and effort expended as evidenced by time studies or space occupied by the various products.

In this manner, each classification of cost will be subdivided into functional subclasses so that the basis of allocation applied to the subclass will be a representative of it. The work of assembling and relating the costs to the statistics is an important step in cost determination to support price differentials. On the one hand we have gathered the statistics. On the other we have separated the costs. It now becomes necessary to put them together so that the results can be used for our original purpose. Trial balances showing the account name the amount should be prepared for each division of expenses, such as, selling expense, general and administrative expense, and warehousing expense. A suitable work sheet should then be prepared for each account in each trial balance showing the statistics as well as the costs. The computations of assigning the costs to the price brackets then can be made. The amounts assigned to each price bracket are next entered in the proper account on the trial balance.

Reporting the Results

The results of this study should be reported in a way which shows clearly the justification for price differentials based on the developed cost differentials. The costs assigned to price bracket classifications may be expressed on a dollar of sales basis or a unit basis. The dollar of sales basis is used generally in those instances where the costs are applied to a community of products or a group of products. The unit basis is more frequently used where the costs are applied to only one or very few products. The computation of the cost per dollar of sales is illustrated in Exhibit 1. As will be noted in the illustration this commodity is sold in four price brackets. Line 1 shows the sales at list price in

each of the four price brackets. Line 2 is the total cost which has been applied to each of the price brackets. Line 3 is the ratio of the cost applied to the sales at list price for each of the price brackets. As Line 3 shows, the cost per dollar of sales at list price for Price Bracket 1 is $1.50, Price Bracket 2 is $1.00, Price Bracket 3 is $.67 and Price Bracket 4 is $.50. If it were desirable to show the costs on a unit basis rather than on a dollar of sales basis, it would then be necessary to multiply each of the costs on Line 3 by the unit list sales price.

The next step in reporting the results is to relate the price differentials to the cost differentials and compare each price and cost differential with *all* other price and cost differentials. Exhibit 2 makes this comparison on a dollar of sales at list price basis. In Exhibit 2 the price scale or discount schedule for the product is shown in Column 2. Column 3 shows the cost per unit of sales at list price for each price bracket. Columns 4 and 5 show the cost differentials and the price differenitals, respectively. Column 6 shows for each price bracket the excess of the cost differential over the price differential (Column 4 less Column 5). Columns 6, 7, and 8 compare the excess of the cost differential over the price differential with each successive price bracket. In other words, in Column 7 the excess of the cost differential over the price differential between Price Brackets 1 and 2 is $.25 per dollar of sales at list price. Between Price Brackets 1 and 3 it is $.33, and between Price Brackets 1 and 4 it is $.40.

Refinements Needed

There is much to be done in the area of distribution costs. However, an approach along the lines indicated in this article seems to be the most appropriate. Undoubtedly many refinements will be developed, especially if the promise of data-processing equipment materializes, but the procedures suggested can do much at the present time to serve management in the difficult area of product pricing.

Accounting for Government-Furnished Material on Defense Contracts

by GEORGE A. POWER

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Maintaining that government furnished materials should be costed and treated as purchased items, this article suggests problems that will otherwise arise and proposes an accounting system suitable for both government and contractor on defense contracts. The benefits of the system to the government and contractors are pointed out and possible objections are considered.

IT IS THE PRACTICE of government agencies to furnish certain types of materials, parts or components on a no-charge basis to prime contractors holding defense contracts. This is government-furnished material. It presents two basic problems and indicates two areas of endeavor that responsible contractors would do well to consider. First, that day of reckoning, when material government-furnished to an activity must be accounted for in terms of delivered product or remaining inventory. It would seem wise, therefore, to provide adequate accounting records and controls at the outset of such a venture when the greatest amount of knowledge concerning the problem is still available. Second, government-furnished material on one order or contract may or may not be the same as that to be furnished on subsequent orders or contracts. In view of this, it is advisable to build into the product cost history the value of all material, parts and components regardless of the manner of acquisition.

In the paragraph to follow, an explanation will be given of one approach to the government-furnished material problem that does much to meet these two needs. Exhibit 1 affords procedural background to assist in following the explanation.

A System of Accounting for Government-Furnished Material

At the time that the agreement is reached between the Government and the contractor, the material to be government-furnished to the contractor is usually known and becomes a part of the legal document. Each party assumes certain obligations or responsibilities in relation to this portion of the contract. The government agency involved must be prepared to make available in sufficient

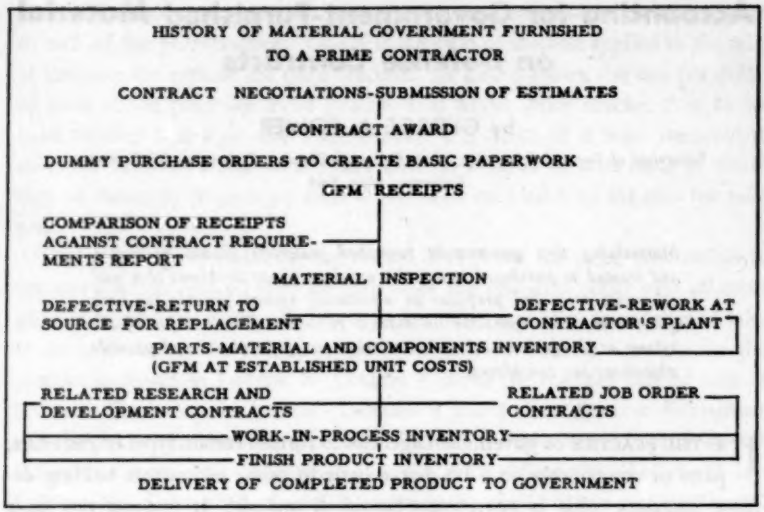
HISTORY OF MATERIAL GOVERNMENT FURNISHED TO A PRIME CONTRACTOR
CONTRACT NEGOTIATIONS-SUBMISSION OF ESTIMATES
CONTRACT AWARD
DUMMY PURCHASE ORDERS TO CREATE BASIC PAPERWORK
GFM RECEIPTS
COMPARISON OF RECEIPTS AGAINST CONTRACT REQUIREMENTS REPORT
MATERIAL INSPECTION
DEFECTIVE-RETURN TO SOURCE FOR REPLACEMENT
DEFECTIVE-REWORK AT CONTRACTOR'S PLANT
PARTS-MATERIAL AND COMPONENTS INVENTORY (GFM AT ESTABLISHED UNIT COSTS)
RELATED RESEARCH AND DEVELOPMENT CONTRACTS
RELATED JOB ORDER CONTRACTS
WORK-IN-PROCESS INVENTORY
FINISH PRODUCT INVENTORY
DELIVERY OF COMPLETED PRODUCT TO GOVERNMENT

EXHIBIT 1

quantities and in time to meet production schedules all such materials agreed upon. The contractor, on the other hand, must take all the necessary precautions to safeguard the material entrusted to him and demonstrate to the government agency that it was used solely for the purpose intended. Therefore, it becomes necessary for the contractor to establish a system suitable for determining the extent to which each party has fulfilled the agreement so that an equitable financial settlement can be made upon termination or completion of the contract.

When the contract has been received and the materials to be government-furnished are known, the following steps can be taken to develop such a system:

1. Dummy purchase orders for the material needed may be issued. This not only informs the various plant personnel concerned of the types and quantities to be received but also lays the groundwork for the issuance of such basic records as receiving reports and defective material reports.

2. When the material reaches the plant, it could be received in the same manner as purchased material. Receiving reports might be created and the material subject to the regular inspection procedure. A regular defective material report could be issued for any material found to be defective and this material held pending disposition information from the cognizant government agency. It should be pointed out in this connection that not all material need be returned for replacement. There will be situations where it is considered in the Government's best interest to rework the defective material rather than return it. A special series of jobs or accounts should be established to collect the cost of such rework operations, since they represent

expenditures that were not included in the original estimate and for which, if of significant value, an upward adjustment in the allotted funds should be made.

3. Fair unit prices of the goods furnished should be requested of the government agency.
4. As the production material is received it should be charged to the inventory accounts based on the prices furnished and credited to a contra account, government-furnished material. The balance in this contra account represents the contractor's responsibility for material supplied to him by the Government. As mentioned previously, it must be accounted for in terms of material-on-hand or goods delivered. The account is reduced and the inventory accounts are relieved for the value of any defective government-furnished material returned for replacement.

By this technique, government-furnished material assumes the same role as regular purchased inventory and becomes subject to the same control procedures. They may be charged to work-in-process upon issuance and be subject to cost variance analyses to determine production efficiency. If required, production usage, spoilage, and balance-on-hand of all such production material may be readily determined.

Use of the System for Accounting Control of the Material

To follow the periodic progress of the material furnished to the contractor in relation to the contractual agreement, a report is prepared at regular intervals listing in successive columns the part or material description, contract requirement quantities, quantities received and balances due. The system proposed here provides the needed information. Also, additional information may be included calling attention to any items running behind the delivery schedule, value of undelivered balance, and similar factors. It is this type of report that will point to those areas, as the contract nears completion, where possible contract adjustments will be required.

Certain benefits accrue to the Government from the proposed treatment of government-furnished material. Many prime contractors are not only operating government production contracts but have, as well, a government research and development contract designed to improve the existing product. Usually this contract will require various combinations of material, including government-furnished material in one form or another, acquired on the production contract. Under the suggested system, all such material used on the research contract will be charged to that contract at the established values and credit for the material transferred given to the production contract. From the view of government accounting, this is desirable because material government-furnished to a production contract is paid for from "production" appropriations and the intent

is that the material should end up in a production unit. By transferring the cost of government-furnished material to a research and development contract, when it is used by that contract, the result is that research and development funds are used, as should be the case, and the corresponding amount is made available for further production spending.

Another instance of benefits accruing to the government that stems from the system is in "leader type" production contracts. These contracts are to contractors who, because of their knowledge of the product and its production difficulties, are used by the government to provide technical services and material to other contractors being established to produce the product on a fixed-price basis. To reimburse the "leader" for the assistance and to collect cost information preparatory to charging the fixed-price contractor, the government awards to the contractor, with the leader-type contract, a "job order" contract. The obvious advantage to the government of pricing into the cost system any government-furnished material included in the units furnished to the fixed-price contractor is that the job order and, therefore, the fixed price contractor is charged for the value of all material delivered to him; not merely the portion for which the "leader" incurred expenditures. To obtain information as to the government-furnished items included in the many deliveries made in this manner, as well as their cost value, might otherwise prove to be a "practical impossibility" for the government. The proposed system accomplishes the task automatically.

Appropriate Costs for Comparisons are Provided by the System

The proposed system of accounting for government-furnished material also lends itself very readily to the problem of obtaining comparative cost figures that can be used both in measuring production efficiency and as a guide to future estimates and quotations. Comparison, a highly important tool of cost accountants, is greatly simplified by the use of the methods outlined. By pricing into the cost system all material, regardless of the method of acquisition, any dangers to comparison that might arise because the material government-furnished to one order or contract differed radically from that of another are eliminated. Any cost variances between contracts then can be attributed to the contractor's organization itself. Also, when government-furnished materials are not priced into the inventory, dollar inventory level comparisons could conceivably show a decrease from one period to another when, actually, inventories could be creeping upward. Such false comparisons would result whenever there was a substantial change in the nature and quantity of material being government-

furnished. When government-furnished material is priced, this situation is avoided and the total inventory, government-furnished material and purchased, can be evaluated and controlled as a unit.

The preparation of the estimate of funds required to fulfill the contract is not hampered in any way by the inclusion of all material in the reproductive cost. When the material is to be furnished is known, it is a relatively simple task to reduce the total estimated cost by the value of this material at the unit cost used in preparing the original estimate. In fact, a certain amount of flexibility is provided. Decisions are sometimes made increasing or decreasing the kinds of material to be furnished after contract negotiations have been started and estimates discussed. Again, alternate proposals under various government-furnished material plans may be required. In either of these cases, with the complete cost of the unit known, any variation of the material to be furnished can be incorporated and the various possibilities readily compared.

Once the contract has been finalized, the remaining loose end to be tied down is the relationship between contract reimbursable expenditures and the cost of product delivered as recorded in the cost system. While it can be argued, perhaps, that the inclusion of government-furnished material in the cost of production complicates such a comparison, the reconciliation is not really a difficult one and in no way outweighs the many advantages of the suggested system. The relationship upon which the reconciliation rests is that the total contract expenditures are equal to the cost of delivered product plus inventories-on-hand less government-furnished material received. Since all of these figures are readily obtainable, no difficulty should be experienced in preparing the reconciliation. For the purpose of the reconciliation any usable government-owned inventory available from previous contracts is considered as government-furnished material to the current contract.

Method Applicable to Cost-Type and Fixed Price Contracts

In summary, an accounting system for government-furnished material should be one that best protects the interests of the Government and the prime contractor and that furnishes the most adequate cost data for efficiency measurement and reproductive-cost usage. With some modification, the suggested system is adaptable to both the cost type and the fixed-price contracts whenever the Government furnishes the prime contractor with material. The diagram below indicates the essential elements of the proposed system.

Cost Control Standards for a Coal Mine

by WAYNE M. WALKER

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It is not uncommon to hear that meaningful standards cannot be set in operations in which volume of production may change sharply in response to outside influences. In this very informative and interesting case study, the methods used by a coal producer in developing appropriate standards are presented. Standards and reports for control at lower volumes of operations are described with indication of appropriate bases of standards for long range planning and inventory valuation. Illustrations give considerable detail to the presentation.

UNLIKE MOST MANUFACTURING PROCESSES in which the predominant portion of conditions affecting production rate are man-made and hence can be measured and/or controlled, underground coal mining conditions are primarily determined by nature. It is a simple matter to compile the operating costs and to convert these costs to a cost per ton. It is, however more difficult to relate the actual costs to what these costs should have been under the conditions prevailing. To control mining costs effectively, realistic standards must be ascertained.

In order to present this case study in as simple a manner as possible, the subject will be developed in three sections, as follows: (1) An attempt will be made to clarify certain terminologies peculiar to mining and to provide a general description of the mining process; (2) a broad description will be given of a former system of standards which was found to be inadequate; and (3) an outline will be furnished of the development and application of the standards now in use, together with graphs and forms.

Coal Mining Terminology and Background

As a start in clarifying certain terminologies used and to provide a better understanding of the processes to which the standards and cost control system applies, a brief description of a typical sectional operation seems desirable. Operations at the mine working face involve extraction of coal as found in the natural seam formation. The thickness of the coal seam varies and is separated by one or more rock partings of as much as 46 inches in thickness. All materials are mined and delivered to the surface, where washing and screening operations

separate usable coal from rock and other diluents. Specific areas within the mine are defined as sections. To each of the sections is assigned a producing crew, a direct sectional service crew, and a section foreman as supervisor. The boundaries of a section are established by mining engineers. The primary openings in the section consist of headings and air courses driven on parallels with separating pillars, and on angles with the mine main line haulageway. The headings and air courses are driven on an average of 18 feet in width, extending from the main haulageway to the company's property boundary. The pillars of coal separating these headings and air courses vary in size in each locality depending on roof structure and the amount of natural support deemed necessary to protect the working area. Cross cuts, driven at right angles to and connecting the headings and air courses, serve as a basis for better air circulation and for increasing the percentage extraction. The several openings in a section normally provide a minimum of four working faces in which a sequence of operations may be developed. This sequence consists of undercutting the face with a mining machine and the preparation of drill holes; charging the holes with powder and exploders, and blasting; loading the coal and rock for delivery to the surface, and cleaning and squaring up the face, i.e., quarrying down loose coal and rock; and setting roof supports, either timbers or roof bolts, and the removal of any obstruction to the operation that is to follow. This cycle may be repeated on each operating shift as often as feasible depending on the number of faces available, the type and capacity of mining equipment in use, and the natural physical conditions encountered in the section. The results of each blast in a particular face is commonly referred to as a "fall". These activities require the use of sectional mining equipment which includes a mining machine for undercutting the coal, a loading machine, two shuttle cars for transporting coal and rock from the loader to mine cars, and a locomotive for switching the mine cars. A sectional labor crew is also required, which varies in size depending on mining conditions, but includes a mining machine operator and helper, a loading machine operator and helper, two shuttle car operators, a locomotive motorman, a trip rider or switchman, and other crewmen to handle supplies, place roof supports, install ventilation material, and similar items.

Inadequacy of Former Standards

In the past, the approach to determining the proper standard production of raw coal (tipple weight) and usable coal has been for the industrial engineer to visit each operating section near the end of each month for the purpose of obtaining data necessary to determine standard shift production for the ensuing

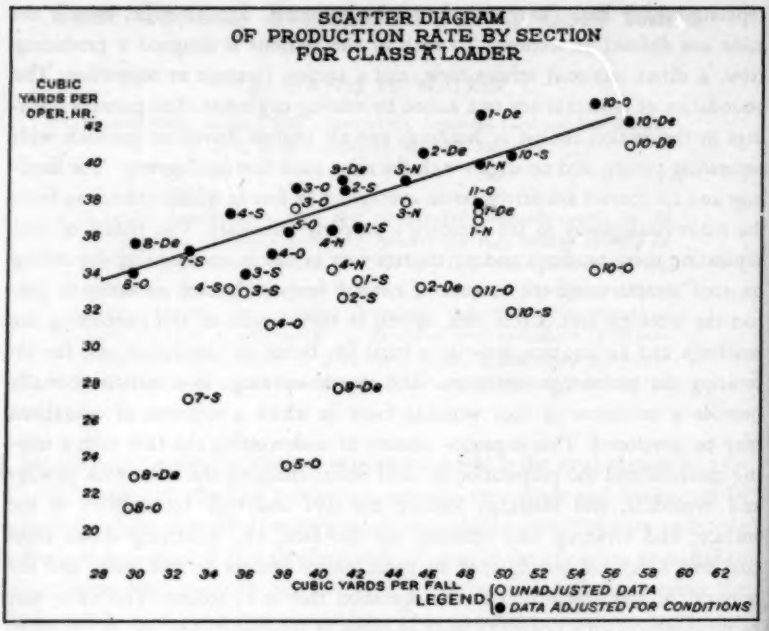

EXHIBIT 1

month. This data included the total seam height, the inches of rock included in the seam, the width of the working faces, and the type of equipment utilized. From this data, he computed the number of tipple weight tons and usable tons per fall of raw coal. Based on the type of equipment utilized, face time (eight hours minus travel time from portal and return), expected delays, physical conditions, etc., the industrial engineer established the standard number of falls per shift. Standard production per shift was developed by multiplying the tons per fall by the standard number of falls per shift. This method had certain undesirable features and, as a result, the subject was studied with an objective of developing a system which would permit evaluation of the various factors, require an absolute minimum of judgment in the application, and provide for easy change in application whenever one or more factors changed.

Development of Improved Standards

The problem was simplified by the conception that the proper measurement of production rate is volume of material handled, rather than weight of either

raw coal or usable coal. This concept assumes that if the fall of raw coal has been properly prepared so that there are no extremely large pieces of rock, the loader can load two tons of rock in the equivalent time required to load one ton of clean coal. Following this line of thinking, the next logical conclusion was that, if loading time required is contingent on volume rather than weight, then a larger fall of raw coal, up to the full capacity of the loader, would result in an increased number of cubic yards loaded per hour, but not necessarily in direct proportion. Loading time for each fall has certain relatively constant components, such as time required for tramming from one fall to another, gas testing, roof testing, and connecting spray lines. Thus, it was concluded that the proper basis of standards was in terms of cubic yards of material loaded per loader operating hour (face time, exclusive of delays).

Through use of tipple weight and usable tons per fall and use of specific gravities of rock and coal, average cubic yards per fall were determined by months for each section operating a Class "A" loader for a representative period. The total monthly production for each section was converted to cubic yards and the cubic yards per loader operating hour was determined. These monthly cubic yards per loader operating hour for actual size of fall were plotted on a scatter diagram (Exhibit 1), with cubic yards per operating hour on one axis and cubic yards per fall on the other axis. A trend was soon apparent that the cubic yards per operating hour did tend to increase as the size of the fall increased. However, it was noted that certain sections deviated appreciably from the trend. It was assumed that the principal cause for deviation was differences in effect of physical conditions experienced from section to section.

After a study of the various factors which would affect production rate of a particular type of equipment, it was decided that the significant factors were: roof conditions, bottom conditions, haulage distance (loading point to sectional side track), grades, power, rib conditions, and rock in seam (excessive thickness). Based on engineering studies and observations, the various degrees of adverse conditions for each of the above factors were defined, classified (as A, B, C, etc.), and evaluated as to percent adverse effect on production rate. A form (Exhibit 2) was prepared, and based on recorded data and knowledge of operations, the industrial engineers classified the physical conditions each month. These reports were approved by the mine superintendent. The letters S, O, N, D, denote the months of September through December.

The actual cubic yards per operating hour for each section were modified for the effects of adverse conditions encountered so as to reflect preformance for all good conditions. These revised cubic yards per operating hour were entered on the scatter diagram as a large black dot. Upon completion of the plot-

DETAILED ADVERSE CONDITIONS EFFECT - %

MINE: Woodland	PER-CENT	SEPT.-OCT. NOV.-DEC. SECTION NO.						JAN. 9, 1955 SECTION NO.	
CONDITION	EFFECT	1	2	3	4	7	8	1	2
ROCK IN SEAM:				S------O------N------D					
A Under 30"	0							x	x
B 30" - 34"	-5								
C 35" - 40"	-8								
D 41" - 46"	-12								
POWER:									
A	0	SON	SO	SOND					
B	-3	D	ND		SOND	SOND	SOD	x	x
C	-7						N		
SUB-TOTAL								-3	-13.
GRAND TOTAL ADVERSE EFFECT % September		-8	-15	-3	-11	-23	-36		
October		-8	-15	-3	-11	-23	-38		
November		-8	-18	-3	-6	-26	-43		
December		-13	-18	-3	-6	-34	-36		
Week of Jan. 9, 1955								-13	-18

EXHIBIT 2

ting of the data, adjusted for conditions, it was obvious that a high degree of correlation existed. Theoretically the trend line of production rate starting at zero would be a parabola which would rise sharply in the lower ranges with increases in size of fall and gradually tend to level off. However, in the range involved, the trend line apparently approached a straight line, therefore the line of regression was determined through the use of the formula:

$$Y_c = a + bX \text{ when } a = \frac{\Sigma X^2 \cdot \Sigma Y - \Sigma X \cdot \Sigma XY}{N \cdot \Sigma X^2 - (\Sigma X)^2}$$

$$b = \frac{N \cdot \Sigma XY - \Sigma X \cdot \Sigma Y}{N \cdot \Sigma X^2 - (\Sigma X)^2}$$

Where X = cubic yards per fall, Y = cubic yards per operating hour, and N = number of cases. The line of regression was plotted on the scatter diagram and inspected to see that it was a reasonable line of best fit. After review and test applications, the line was accepted for use as a basic standard production rate for Class "A" loaders. Standard production rate lines were developed in a similar manner for three other classes of loading equipment in operation. Standard production rate expressed in terms of cubic yards per operating hour thus could be determined by reference to the graph and reading on the Y axis, the cubic yards per operating hour for good conditions for a Class "A" loader with a known fall size.

However, the objective extended beyond mere determination of production rate per operating hour. The aim was to establish a long range or standard practice standard production rate per shift, detailing specific conditions expected to be encountered such as: seam height, composition as to coal and rock, width of working faces, travel time, size of fall, physical conditions of roof, bottom, grades, ribs, and haulage distances and power conditions. In addition, for cost control purposes, a statistical standard would be applied, based on conditions actually encountered at the time, with evaluation of the effects of differences by cause between the statistical budget and the standard practice standard. In studying the possible methods of application it was observed that tipple weight tons at a given usable coal yield can be substituted for cubic yards along the X and Y axes of the graph and the production rate line in relation to the size of the fall would remain unchanged. Similarly, usable tons for a given yield can also be substituted along the X and Y axes without affecting the location of the proper production rate line. This relationship permits a surprisingly simple application of the standard.

To determine standard usable tons per operating hour for good conditions;

1. Convert the constant cubic yards per operating hour (24.9) to usable tons at actual yield through reference to a table, and add usable tons per fall multiplied by the slope factor for the production rate line (.314).
2. Multiply (a) by operating time per shift after recognizing standard delay time.
3. Modify for effect of adverse conditions.

Reproduced below is a portion of the table referred to in Item 1 above:

TABLE OF NET TONS OF USABLE COAL FOR CUBIC YARDS OF RAW COAL AT CERTAIN YIELDS

		Net Tons —	Usable Coal
Coal Yield	1	24.9	28.0
Percent	Cubic Yd.	Cubic Yds.	Cubic Yds.
59.0	.802	19.97	22.46
59.5	.806	20.07	22.57
60.0	.810	20.17	22.68
64.5	.847	21.09	23.72
65.0	.852	21.21	23.86
65.5	.855	21.29	23.94
66.0	.859	21.39	24.05

The statistical budget for each section and analysis of difference by cause between such budget and the standard practice standard are developed weekly. (Exhibit 3). For Lines 9 and 10 on Exhibit 3 refer to the above table and for Line 16 refer to Exhibit 2 which is prepared by the industrial engineer and approved by the mine superintendent. Since about one-third of the information

WORK SHEET FOR DEVELOPMENT OF SECTIONAL PERFORMANCE BUDGET AND OFF STANDARD CONDITIONS EFFECT

PERIOD: January 9, 1955 — Woodland MINE

No.	Derivation	Description		Section No. 1	Section No. 2
1	Ind. Eng.	Face Time Per Shift (Decimals)		7.43	7.22
2	Ind. Eng.	Actual Type of Face Equipment Operating		Class A	Class B
3	Standards	Constant Prod. Factor-Cubic Yards/Processing Hour		24.9	28.0
4	Standards	Variable Production Factor		.314	.365
5	Exhibit "D"	No. of Sectional Shifts Operated for Period		10	7
6	Exhibit "D"	Usable Production for Period - Actual Net Tons		1755	1492
7	Exhibit "D"	No. of Falls Loaded for Period		50	38
8	6 ÷ 7	Usable Tons Per Fall		35.1	39.3
9	6 ÷ Act.T.W.	% Yield		65.0%	59.3%
10	9 on Chart	Usable Tons Per Cubic Yard - Actual Yield		.652	.806
11	3x10 or Chart	Budgeted Usable Tons Per Processing Hr.-Good Cond.	Constant for Type of Equipment	21.21	22.57
12	4 x 8		Variable with Size of Fall	11.02	14.34
13	11 ÷12		Total Bud.Tons/Proc.Hr.-Good Cond.	32.23	36.91
14	1 x (.925)	Processing Hrs. Per Shift (Face Time Less Std. Delays)		6.87	6.72
15	13 x 14	Budgeted Usable Tons/Shift - Good Conditions		221	248
16	Ind. Eng.	Effect of Physical Conditions %		-13	-18
17	15x [(100+16)	Sectional Performance Budget	Usable Production/Shift-Net Tons	192	203
18	2 x 17		Usable Production for Period-Net Tons	1920	1421
19	15 ÷ 9		Net Tippleweight Tons for Period	2951	2392
20	25 ÷ 17		Producing Labor Cost/Usable Ton	.848	.852
21	26 ÷ 17		Service Labor Cost/Usable Ton	.336	.319
22	17 ÷ 8		Falls Per Shift	5.5	5.1
23	17 ÷ Bud.Min		Usable Tons/Miner Day	21.33	22.56
24	23 ÷ 1		Usable Tons/Miner Hour	2.87	3.12
25	Standards	Standard Practice Standard	Producing Labor Cost/Shift at Std. Atten.	162.88	162.88
26	Standards		Service Labor Cost/Shift at Std. Atten.	64.70	64.70
27	Standards		Type of Face Equipment	Class A	Class A
28	Standards		Usable Prod./Shift-Std. Pract. Face Equip.	200	185
29	Standards		Usable Prod./Shift-Actual Face Equip.	200	212
30	Standards		Sectional Labor Cost/Usable Ton	1.137	1.223
31	Standards		Processing Hours/Shift	6.89	6.72
32	Standards		Adv. Effect of Seam & Roof Strata Cond.-%	-8	-5
33	Standards		Adv. Effect of Haul., Dist., Grades & Power-%	0	-10
34	Standards		Usable Tons/Proc.Hr.-Act.Equip.-Good Cond.	31.65	37.15
35	(29 - 28)x 5	Statistical Off-Standard Variance For Period-Usable Tons	Admixture of Face Equipment	-	185
36	**A		Proportion of Coal in Seam & Size of Fall	36	10*
37	**B		Seam and Roof Strata Conditions	44*	-
38	**B		Haulage Distance, Grades & Power Cond.	66*	53*
39	**C		Travel Time	6*	-
40	(17-28)x5&Add.		Total Off Standard Variance-M.T. Us. Coal	80*	119
41	30 -(20+ 2)	Total Budget Adjustment - Cost Per Usable Ton		.047*	.102
42	(47 ÷ 40)x35	Statistical Off-Standard Variance For Period-Dollars	Admixture of Face Equipment		232
43	(47 ÷ 40)x36		Proportion of Coal in Seam & Size of Fall	37	13*
44	(47 ÷ 40)x37		Seam and Roof Strata Conditions	45*	-
45	(47 ÷ 40)x38		Haulage Distance, Grades & Power Cond.	68*	67*
46	(47 ÷ 40)x39		Travel Time	6*	-
47	41 x 6 & Add.		Total Off Standard Variance - Dollars	82*	152

* Denotes Red Figure

** A = (13 - 34) x 31 x 5 x [(100)-(32+33)]

** B = 15 x (.01) x 5 - Factor to apply to each 1% diff. between std. & cur. cond.

** C = 13 x [14 - 31] x 5 x [(100) - [32+33] 16 vs. 32+33

EXHIBIT 3

on Exhibit 3 remains unchanged for a relatively long period, such data is preprinted to expedite preparation of the work sheet.

In order to simplify explanation of the weekly development of the statistical sectional performance budgets, certain items appear in Exhibit 3 without explanation as to source. Such data includes usable production, tipple weight production and number of falls loaded. This information is a part of the daily

controls. In the development of the daily control reports it was determined that certain factors would be more readily adaptable to control and also that a prerequisite to reporting would be simplicity. For the latter purpose, the factors incorporated into daily control reports generally have been presented in quantitative units only. The selected factors for daily reporting are: (1) manpower, (2) production, (3) delays, (4) certain physical conditions under which the crews work and (5) the volume of work performed, expressed in such terms as working faces cut and shot, falls loaded and left ready to load by succeeding crew, number of roof pins set, and number of cars loaded.

Application of Cost Controls Under the Improved Standards

The daily controls as developed serve two purposes. The first, and most important, of these consists of providing all levels of mine management with the basis for a quick evaluation of the previous day's operating results. The second function is to provide the data required by the accounting department for the preparation of the longer term reports. This is accomplished by summarizing and evaluating the quantitative data. The initial daily cost control report is the sectional performance report. It is prepared by the section foreman and is approved by the assistant mine foreman and the mine foreman after which it is furnished to the mine superintendent and the accounting department.The sectional performance report shows for each working place the status at the beginning of the shift (cut, ready to load, pinned or not pinned, or squared up), the height of seam, thickness of rock in seams, average depth of cut, number of cuts made, number of falls shot, number of falls loaded, explosives used, rock dust used, and status at the end of the shift. This report also shows number of cars loaded each hour during the shift and the accumulated total; condition of equipment at the end of the shift; and delays detailed by equipment number and type, cause and minutes duration of each delay as well as direct time effect on the loader. The cost control unit and section performance report is prepared from data assembled from the sectional performance report and the daily distribution of labor report and a work sheet for accumulation of budgets, actual and variance for delays. This report includes in addition to "day turn" (Exhibit 4) information on "owl turn," "night turn" and a "total 24-hour day."

The budgeted falls, tipple weight production, usable production, producing labor cost and service labor cost are determined from the sectional performance budget section of Exhibit 3 (Lines 17-24). The budgets for operating supplies are based on (1) the standard dollar cost per fall for the approved shooting and timbering plan for the section and (2), for other operating supplies, the

Sect. # 1 Unit # -
Class of Coal

COAL MINING DEPARTMENT
COST CONTROL -- UNIT AND SECTION PERFORMANCE

BUD. US. TONS/ BUD. COST/U. TON

PERIOD	% YIELD	MINER DAY	PROC. HOUR	PROD. LABOR	SERV. LABOR	TOTAL LABOR
1	65.06	21.33	28.0	848	.336	1.184
2						
3						
4						
5						

BUDGET PER USABLE TON

PERIOD	LUBRICANTS	TOOLS' ACCES.	EXPLOSIVES	TIMBERS	VENT. MAT'L.	ALL OTHER
1	.005	.003	.093	.085	.025	.020
2						
3						
4						
5						

DAY TURN

DATE	Number Of Men Working Miners	Serv. Men	No. Faces Cut	No. Faces Shot	Falls Cleaned Up Bud.	Falls Cleaned Up Act.	Falls Cleaned Up Var.	Falls Left Ready To Load	Tippie Weight Tons Prod.
BUD.	9	4.3							
3	9	5.	5.0	5.0		5.5		1.0	297
4	9	4.	4.0	4.0		5.0		1.0	271
5	9	5.	5.0	5.0		5.5		1.5	294
6	9	5.	5.0	6.0		5.5		1.5	298
7	9	4.	5.0	5.0		4.8		1.8	260
T	45	23	24.0	25.0	27.5	26.3	1.2*		1420

ANALYSIS OF PRODUCTION VARIANCE

DATE	Labor Performance	Delays Equipment Failure	Delays Equipment Moving	Delays All Other	Quota of Miners
BUD.					
3					
4					
5					
6					
7					
T	119*	58*	--	12	--

PROD. LABOR

DATE	Straight Time Bud.	Straight Time Act.
BUD.		
3		326
4		326
5		326
6		325
7		326
T	1488	1629

SERVICE LABOR

DATE	Straight Time Bud.	Straight Time Act.
BUD.		
3		139
4		123
5		123
6		139
7		123
T	590	647

ANALYSIS OF VARIANCE BY CAUSE

DATE	Grand Total Budget Bud.	Grand Total Budget Actual And Variances Act.	Var.	Labor Performance	Rate of Production Delays Equipment Failure	Rate of Production Delays Equipment Moving	All Other	Quota Of Face Labor	Quota Of Service Labor
BUD.									
3		564							
4		514							
5		511							
6		569							
7		539							
T	2533	2697	164*	101*	50*		10	--	57*

Economy By Cause

DATE	Admixture Of Rates	Use of Supplies	Misc.
BUD.			
3			
4			
5			
6			
7			
T	--	34	

*DENOTES RED FIGURE

standard rates per cubic yard converted to rates per ton, based on coal yield.

One of the most important factors of cost control is the degree of control in the hands of the lower levels of supervision. The importance of control at the section level is evidenced by the relatively high ratio of costs incurred at that point to the total end-product costs and by the effects of sectional production factors on cost elements incurred at other points in the overall mining and washing operations. A major consideration for control reporting at this level was the selection of terminology familiar to the section foreman and a determination of those factors in the sectional mining operation which would, when properly controlled, result in favorable production and cost. The factors finally selected were those previously referred to in the discussion of daily control reports.

For weekly cost control purposes further divisions of these major production and cost factors are made into components which, when studied from the standpoint of inter-relationship, furnish interesting and valuable control information. An example of a Weekly Sectional Cost Control Report is shown as Exhibit 5. A comparison of budget and actual production for the week shows an unfavorable variance from the budget in the amount of 254 tipple weight tons. The budget was to cut, shoot and load 55.0 working faces for the period. Results show unfavorable variances of 4.0 faces cut, 4.0 faces shot and 5.0 falls loaded.

Theoretically, the status of the operation at any given time would be one working face in the process of being timbered and prepared for undercutting, one face being undercut and drilled, one face prepared and blasted, and one fall in the process of being loaded. The maintenance of this sequence, so that a fall is ready to load at all times, is extremly important in attaining maximum production. A section is operated two shifts per day, five days per week. The section foremen in charge of these crews must operate as a team if the cycle of operation is to be maintained at standard. The report is designed to indicate the degree in which each foreman is off the prescribed cycle. The principal cause of off-cycle mining is equipment delays. Underground mining equipment is of necessity compact in order to maneuver in restricted areas. This compactness, along with adverse working conditions such as dampness and restricted lighting, contributes to equipment failures. Thus, the control of delays is a prime factor in the cost picture. Since delays can exert such a pronounced influence on production, the average production per operating hour, which is an expression of crew performance during actual operating time, is incorporated as a part of the control report. Actual production per operating hour is determined by dividing actual tipple weight tons for the period by crew face-time hours, less sectional delay time. Budgeted production is developed by dividing the budgeted tipple

WEEKLY SECTIONAL COST CONTROLS

Face Time Per Shift 7:26 Hr. — Mine Woodland
Seam Section: Coal 62 In. — Section No. 1
Rock 16 In. — Week Ending Jan. 9, 1955
Type of Operation Class "A" Loader - Shuttle Cars - Advance — Location 10 W 2 W
Section Foreman: Owl _____ Day John Doe — Night Sam Smith

		TOTAL - ALL SHIFTS			OWL TURN		DAY TURN		NIGHT TURN	
		BUDGET	ACTUAL	VARIANCE	ACTUAL	VARIANCE	ACTUAL	VARIANCE	ACTUAL	VARIANCE
SECTIONAL SHIFTS		10	10	-			5	-	5	-
Production Net Tipple Weight Tons	Total	2951	2697	254*			1120	56*	1277	198*
	Sectional Shift	295	270	25*			284	11*	255	40*
	Operating Hour	43	43	-			44	1	42	1*
	Reduced Shift	32.79	29.97	2.82*			31.56	1.23*	28.38	4.41*
	Per Sect. Non Shift	22.88	20.43	2.45*			20.88	2.00*	19.95	2.93*
Average Net Tons Worked Per Day	Producing	18.0	18.0	-			9.0	-	9.0	-
	Service	7.8	8.4	.6*			4.6	.3*	3.8	.3*
	Total	25.8	26.4	.6*			13.6	.3*	12.8	.3*
Number Working Points	Cut	55.0	51.0	4.0*			24.0	3.5*	27.0	.5*
	Shot	55.0	51.0	4.0*			25.0	2.5*	25.0	2.5*
	Loaded	55.0	50.0	5.0*			26.3	1.2*	23.7	3.8*
Average Tipple Weight Tons Per Car		XXX	3.64	XXX		XXX	3.70	XXX	3.61	XXX
Cost Per Net Tipple Weight Ton							SECTIONAL EQUIPMENT DOWN TIME			
Labor - Producing		.552	.604	.052*	EQUIPMENT NAME AND NUMBER		TIMES DOWN	HOURS DOWN TIME: TOTAL	OWL	DAY	NIGHT
Labor - Sectional Service		.219	.240	.021*							
Supp. - Lubricants		.005	.004	.001	Shuttle Car #180		6	3.9		2.4	1.5
" - Tools and Accessories		.001	.001	.002	" " #185		3	3.5		.5	3.0
" - Explosives		.060	.056	.004	Loader 25		5	4.2		1.0	3.2
" - Timbers or Roof Bolts		.055	.057	.002*	Wait on Empties		7	3.5		2.0	1.5
" - Ventilation Supplies		.025	.022	.003	All Other		3	1.4		.9	.5
" - Other Supplies		.020	.016	.004							
TOTAL SUPPLIES		.168	.156	.012							
TOTAL SECTIONAL MINING		.939	1.000	.061*							

* Denotes Red Figure

EXHIBIT 5

weight tons for the period by the budgeted operating hours. Overall results show that budgeted production per operating hour was attained with a favorable variance for the day turn and an offsetting unfavorable variance for the night turn of one tipple weight ton per operating hour. Therefore, the loss of 254 tipple weight tons can be attributed to the adverse effect of delays in excess of budgeted allowance. Operation of the section involves the use of such operating supplies as explosives, timbers, brattice cloth, concrete blocks and other ventilation materials, tools, lubricants, etc. Control of these elements is centered around the requisitioning of requirements and their proper storage and handling after delivery underground. Although the day shift section foreman is responsible for ordering supplies for both shifts, control of usage by both section foremen is essential for favorable cost. The sectional cost control report, which has been described in the foregoing, is filed weekly in a pocket-size notebook, thereby building a ready reference of comparable data.

Production and cost trends reports, consisting of three sheets per mine, are also prepared weekly. One sheet is a recapitulation of sectional mining costs, which presents by sections most of the data exhibited on the weekly sectional cost controls as well as mine totals. In addition, coal yield and production data and cost are shown on a usable coal basis. Another sheet shows by sub-respon-

sibility, beginning with sectional mining, the costs of labor, operating supplies and repairs and maintenance for the week. Other general costs such as salaries, depreciation, taxes, wage vacation provision, welfare and retirement fund, coal washing costs, services and utilities are also shown so that the total operations cost, or the mine cost, for that particular week are obtained. These dollars of actual costs are compared with budgets and variances are analyzed by cause. The third sheet reflects the number of turns operated, men per day, total production for the period, budgeted and actual production per day, budget and actual productivity of labor, and cost per usable ton shown as total budget, total actual, and variance. Actual cost is also sub-divided into labor, materials and supplies, and other elements of cost. These statistics are shown for each week and month-to-date. Copies of the production and cost trends are furnished all levels of mine supervision and top management.

A letter called the weekly analysis of operations is written to the general superintendent highlighting the production, productivity and cost data for the week and indicating outstanding favorable and unfavorable variances and causes therefor, as well as significant changes from the previous week. Monthly summary reports and a letter called monthly summary of operations are prepared principally for the higher levels of management, although copies of selected sections, which are of particular interest to the division supervisors, are distributed to that group. These summary statements represent an accumulation of the data which has been collected in the course of developing the short-term control reports.

Standards for Long Range Planning and Inventory Valuation

The foregoing explanations of the development and application of production rate standards, as well as the cost control system has dealt primarily with the current or statistical budgets which are designed to measure performance under conditions actually experienced. It should be pointed out that in addition the final basis of measurement is the standard practice standard which is based on long range conditions. Standard practice standards provide guide posts for long range planning and are the basis of inventory evaluation. At standard practice conditions there would be no difference between the statistical budget and the standard practice budget since both are based on the same basic standards. The effects of differences between actual conditions encountered and standard practice conditions are called off standard conditions of mining. The off standard conditions are detailed by the various causes, i.e., effect of physical

conditions with appropriate breakdown, off standard travel time, and off standard shooting and timbering plans.

Dealing With a Complex Situation

The characteristics of coal mining operations are inherently complex, which makes the problem of providing a satisfactory system of real cost control very difficult. The experiences as brought out in this study have proven that through coordination of effort by the operating, engineering, and accounting functions a satisfactory solution can be attained. Coal is facing tremendous competition from oil, gas, and electricity and because of this, the necessity for lower production costs is a matter of survival in many areas. Proper application of cost accounting principles will provide a major means of keeping coal competitive in our industrial picture.

Costing for Contracting Stevedores

by FRANCIS L. DURAND

Chief Accountant, Port Arthur Stevedores, Port Arthur, Texas

After pointing out the need for special types of cost information for contracting stevedores, this article deals procedurally with means for providing desired data. Because labor is the main cost element, it is maintained that most costs can be related to direct labor cost and assigned to specific activities accordingly. However, the procedure also suggests the appropriate treatment for costs which can be considered direct. It is indicated that the cost accounting necessary may be economically performed.

THIS ARTICLE DISCUSSES problems involved and procedures employed in costing operations for a contracting stevedore. Use of the term "stevedore," in this sense, refers to one who employs labor, equipment, and materials in rendering to operators of vessels service such as loading or discharging of cargo, handling of stores, and securing cargo. The term "contracting" stems from the fact that in most instances the equipment and materials to be furnished by the stevedore and that to be furnished by the operator of the vessel, on which rates of compensation are based, are set forth in a contract between the stevedore and the operator of the vessel. Normally, the loading and discharging of cargo results in compensation to the stevedore based on a piece or tonnage commodity rate. The contracts also usually provide, however, for compensation to the stevedore for specific services rendered on the basis of actual labor cost plus fixed percentages. Certain other costs, such as overtime pay, are ordinarily passed on to the operator of the vessel.

Proper Costing Needed for Pricing and Control

Contracts for stevedoring operations are negotiated between the contractor and each individual operator. In order for the contractor to be in a position to negotiate profitable contract prices, it is a prerequisite that he be fully aware of his costs with respect to specific operations. In the course of the stevedoring operations aboard one vessel, the contractor may be required to handle a variety of types of commodities, each of which may bear a different commodity rate; perform services for which he is compensated on a cost-plus basis; and incur costs with respect to overtime labor which are to be passed

TIME SHEET - FRONT SIDE

XYZ Stevedoring Co.

Daily Time Report

Date 2-15-19a — Location Port X

Vessel Sea King — Working Hours 7:00 a.m. - 1:30 p.m.

Hatch No. 3

S.S. No.	Name	Hours ST	Hours OT	Rate ST	Rate OT
	Walking Foreman:				
1	John Doe	4-1/2	1	3.00	4.50
2					
	Gang Foreman:				
	J. T. Roe	4-1/2	1	2.50	3.75
	Longshoremen:				
1	B. Smith	4-1/2	1	2.40	3.60
2	C. Jones	4-1/2	1	2.40	3.60

TIME SHEET - REVERSE SIDE

	A				B				C			
7 a.m. - 8 a.m.	(0)	15	30	45	0	15	30	45	0	15	30	45
8 a.m. - 9 a.m.	0	15	30	45	0	15	30	45	0	15	30	45
9 a.m. - 10 a.m.	(0)	15	30	45	0	15	30	45	(0)	15	30	45
10 a.m. - 11 a.m.	0	15	30	45	0	15	(30)	45	0	15	(30)	45
11 a.m. - 12 N.	0	15	30	45	0	15	30	45	0	15	30	45
Meal Hour												
12 N. - 1 p.m.	0	15	30	45	(0)	15	30	45	0	15	30	45
1 p.m. - 2 p.m.	(0)	15	(30)	45	0	15	30	45	0	15	30	45

EXHIBIT 1

on to the operator of the vessel. The computation of costs on such an operation, therefore, must be such that it is possible to estimate profits or losses on each specific phase of the operation. Also, of course, such cost construction provide a means of cost control.

Nature of Contracting Stevedore Operations

The principal cost incurred by a stevedoring contractor is labor. Ordinarily, longshoremen are not part of the contractor's pemanent labor force. They are members of labor unions who form a labor pool in a port from which all stevedoring contractors draw as needed. The pay scale of longshoremen is set by an agreement between the labor union and all stevedoring contractors who operate

in the area which comes under the jurisdiction of the union. Longshoremen are employed in "gangs" each consisting of a certain number of men, one of whom is the gang foreman. The gang foreman is the man who is responsible for the longshoremen in his group insofar as carrying out the contractor's orders is concerned. However, a contractor may deem it advisable to retain "walking foremen" to be assured of a source of supervisory personnel to meet his requirements.

Equipment requirements of stevedoring contractors vary with the type of services performed. The type of equipment required to efficiently load or discharge commodities depends upon (1) the type of commodity, and (2) the method of operations. Normally, the contract between the stevedoring contractor and the operator of the vessel provides for use by the contractor of facilities aboard the vessel, such as winches and booms, free of cost to the contractor. The contractor will be required to furnish equipment which may be classified as (1) mobile equipment, and (2) other gear. Under the first category would appear depreciable items such as lift-trucks, dock tractors, and trailers which require maintenance by the contractor. The classification "other gear" would include items which could be considered expendable, such as slings, hooks, manila rope, and pallets, and these may be either purchased or assembled.

Methods and Procedures for Collecting Stevedoring Costs

Many methods could be used in order to obtain adequate cost information for a stevedoring contractor, but the method selected should be a balance between the importance of the information and the cost of providing it. In this article, a system is described which does not require the services of personnel at the scene of operations whose duties are restricted to the gathering of cost information. Exhibit 1 sets forth a sample of the Daily Time Report used for collecting labor cost.

The number of men employed in the operation is set forth on the front of the time sheet, together with hours worked and applicable rates. The gang hour cost for labor can then be worked out. For example, if the longshore "gang" was composed of one walking foreman, one gang foreman, and ten longshoremen, the gang hour cost would be $29.50. By referring to the reverse side of the time sheet, the time spent handling each commodity may be computed by reading from circled figure to circled figure in the appropriate columns. Application of gang hour cost to the time breakdown thus derived will result in labor cost applicable to each commodity, as follows:

	A	B	C
7:00 a.m. — 9:00 a.m.	2		
9:00 a.m. — 10:30 a.m.			1½
10:30 a.m. — 12 N.		1½	
1:00 p.m. — 1:30 p.m.	½		
Total Hours	2½	1½	1½
Labor Cost	$73.75	$44.25	$44.25

If the union agreement called for regular working hours of 8 a. m. to 5 p. m. with a meal hour from 12 noon to 1 p.m. and an overtime premium of one-half times the regular wage scale to be paid for hours worked outside of regular working hours, the longshore gang would receive an overtime premium of $14.75 for the hour from 7 a.m. to 8 a.m. This is not accounted for in the illustrated cost analysis but will be included in the payroll for the period during which the operation took place. The contractor's records, because overtime pay may be passed on to the owner of the vessel, may call for a separate accounting for this cost and payroll distribution handled accordingly. The time sheet noted above, therefore, would be costed for the full amount of $177. Costs of payroll insurance and payroll taxes, both of which are measured in terms of percent of labor (15 percent in this illustration), may be computed for any operation by simply applying appropriate percentages to labor cost of each commodity.

The distribution of equipment usage costs by commodities will be based on the time spent handling the various commodities, as indicated by the time sheets. With respect to mobile equipment, through the experience gained from past operations, the contractor may arrive at a cost of operations of varied units on an hourly basis. For equipment rented, of course, this hourly cost is fixed by the invoice of the lessor, due to the fact that such equipment is normally rented on an hourly basis. The cost of furnishing slings, pallets, hooks, and similar items will have to be allocated to stevedoring operations and commodities handled on the basis of some time unit or percentage. By reviewing past operations, the cost of acquiring and maintaining these items may be determined and converted to a percentage of direct labor or cost per hatch (gang) hour. Continuing further, on the assumption that the contractor owns and operates his own equipment, experience derived from past operations will allow the contractor to determine the approximate average number of units of mobile equipment required to handle any specific commodity. This factor applied to the hourly cost of operating these units will result in a method of distributing costs of operating mobile equipment to commodities handled.

Now, assume the contractor has determined his cost of furnishing other gear is $2.00 per hatch hour, that cost per hour for operating mobile units and number of units required per hour for handling various commodities are as indicated below. The cost of equipment usage, then, in the case of the operations covered by the time sheet illustrated in Exhibits 1 and 2, would be as follows:

	A	B	C
Mobile equipment:			
2 lift trucks @ $3.50 for 2½ hrs.	$17.50		
1 tractor @ $3.00 & 2 trailers @ $1.00 for 1½ hrs.		$ 7.50	
1 lift truck @ $3.50, 1 tractor @ $3.00 and 1 trailer @ $1.00 for 1½ hrs.			$11.25
Other gear	5.00	3.00	3.00
	$22.50	$10.50	$14.25

Materials furnished by a stevedoring contractor may be purchased as needed, or stockpiled in order that the contractor may be assured of a sufficient supply on hand at all times. In the former case, of course, the cost may be transferred directly from the vendor's invoice to the cost analysis sheet. In such cases, the important factor is the identification of vendor's invoices with related stevedoring operation, but this can be handled in the contractor's voucher distribution through the use of appropriate coding designators. Where a contractor stockpiles these materials, however, he must determine a unit cost in order to distribute the cost of materials used to appropriate operations. The determination of this unit cost is accomplished by accumulating cost of materials, labor, equipment usage at the stockpile, and other costs of acquisition and dividing the total by the number of units involved. The cost of transporting the material from the stockpile to the site of the operations should be charged directly to the operation requiring the materials. This computation, for dunnage lumber, would be along the following lines:

Cumulative data for ..... month period:	
Dunnage purchased	500,000 ft.
Cost	$21,500.00
Labor at stockpile plus payroll burden applicable.....	360.00
Equipment usage at stockpile — 40 lift truck hours @ $3.50.....	140.00
Total Cost	$22,000.00
Cost per M.S.F.T.	$ 44.00

SAMPLE COST SHEET

XYZ Stevedoring Co.

Cost Summary

Date 2-15-19a — Job Sea King

Location Port X

	Commodity or Operation			
	A	B	C	Total
Labor	$ 73.75	$44.25	$44.25	$162.25
Payroll Burden (15% of Labor)	11.06	6.64	6.64	24.34
Equipment usage	22.50	10.50	14.25	47.25
Supervision (1.53% of Labor)	1.12	.68	.68	2.48
Damages	-0-	-0-	-0-	-0-
_____	-0-	-0-	-0-	-0-
_____	-0-	-0-	-0-	-0-
	$108.43	$62.07	$65.82	$236.32
Administrative Overhead (10% of Labor)	7.38	4.43	4.42	16.23
	$115.81	$66.50	$70.24	$252.55
Number of tons	60	30	40	
Cost per ton	$ 1.93	$ 2.22	$ 1.75	

Material Cost

20,000 ft. Dunnage @ $44.00	$880.00
Labor	9.60
Payroll Burden	1.44
Equipment Usage	30.60
	$921.04

Reimburseable Costs

	Overtime	Detention Time
Labor	$14.75	$ -0-
Payroll Burden	2.21	-0-
	$16.96	$ -0-

Date Billed_____ Invoice No. _____

Computed by_____ Approved_____

EXHIBIT 2

A cost method which provides for the use of rates to be applied to a determinable figure, such as the application of rates to hours in computing equipment usage costs and application of rates to footage of dunnage noted in the foregoing illustrations, requires the use of variance accounts. The variance accounts allow the contractor to determine, by a comparison of equipment and material,

cost of actual operations with applied costs, whether rates being used are realistic.

Where a contractor employs a group of walking foremen or superintendents on a straight salary basis, the cost per hour for maintaining these employees should be determined and distributed to actual operations. The hourly cost is the result of the number of hours employed divided into compensation paid plus payroll burden for a selected period. Or the same distribution could be obtained by converting cost of having the services of these employees available to a percent of direct labor for a selected period and distributing these costs on the basis of direct labor. For example, assume the XYZ Stevedoring Company employed a stevedoring superintendent who was paid $10,000.00 annually, and direct labor, exclusive of overtime premiums, for a selected annual period was $750,000.00. The appropriate percentage (1.53) to be used in distributing cost of supervision might be determined by adding payroll taxes and insurance ($1500) to the walking foreman's salary and dividing the total ($11,500) by the direct labor cost ($750,000).

Direct costs, such as damages, not discussed above, may be readily distributed to specific operations by employment of appropriate accounting codes. Invoices covering cargo or vessel damage will designate specifically the operations during which such damages occurred. In order to apply administrative overhead to a specific operation, the contractor must determine a basis on which overhead is to be distributed. Direct labor may be used. For example, suppose XYZ Stevedoring Company had administrative overhead during a selected year of $75,000 and its direct labor cost for the same period was $750,000. In determining the rate to bid for handling a specific commodity, management must take into consideration to other costs, 10 percent of direct labor cost to provide for administrative overhead, prior to arriving at a rate which includes an increment of profit.

Cost Reports to Compare With the General Ledger

The gathering of cost information must be performed in such a manner that it may be accumulated and compared to general ledger accounts for the determination of variances. A method of doing this may be illustrated. Assuming that 60 tons of Commodity A, 30 tons of Commodity B and 40 tons of Commodity C were loaded by the longshore gang covered by the time sheet illustrated in Exhibit 1, a sheet such as that illustrated by Exhibit 2 could be used to gather the pertinent cost information.

The cost summary illustrated in Exhibit 2 may be varied to fit a particular contractor's accounting system. However, it furnishes the basic information

desired. During any single operation more than one longshore gang may be required as, for example, when several hatches are being worked. In addition, there may be periods during the time covered by the time sheets when the contractor is compensated for services performed on a cost plus basis or operations are delayed due to factors beyond his control and he is reimbursed for his labor cost plus taxes and insurance applicable to these periods (detention time). Such information may readily be collected on supporting columnar sheets by cost classification, distributed to commodities handled, etc., and the total carried forward to the cost sheet or may be collected separately and entered only at the time the cost sheet is prepared. At the end of any selected period the cost sheets covering operations during the period should be summarized by cost classification and commodities handled. The cost classification summary may be used for comparison to general ledger accounts and determination of variances with respect to payroll burden, equipment usage, materials, supervision, and overhead. The commodities handled summary should indicate costs and units and a cumulative per unit cost, as well as the average loading (or discharging) rate per hour.

What Management Gets

Management, in reviewing the commodities cost summary, may use the data presented to go over the prevailing rate structure and correlate it with per unit cost of handling varied types of commodities, or may undertake an investigation of unit costs which appear to be out of line.

The method described herein may be converted to a method for estimated costs in bidding on contracts to handle commodities for which the contractor has no per unit costs based on past experience. The size of the longshore gang, equipment required, and other appropriate information may be estimated and an estimated gang hour cost computed. A number of units handled per hour may be similarly estimated and the cost per hour converted to a cost per unit which would serve as a basis for arriving at a per unit rate to be used for bidding purposes.

The system, procedures, and forms, submitted in this article are not intended to represent those which would fit the needs of any stevedoring contractor. However, application of the principles outlined herein, with appropriate variations governed by the individual operation, in the author's opinion, will result in the obtaining of information which is of prime value as an aid to management in setting rate structures and controlling costs.

Before the Fact Control of Material Prices

by NIESON N. SHAK

Assistant to the Treasurer,
Airborne Accessories Corporation, Hillside, New Jersey

Suggesting that material price variances should be determined at the time the purchase order is issued, this descriptive article of a procedure for controlling material prices may be welcomed as an addition to control accounting literature. The usual textbook approach to the problem of material price control is examined critically in the first sections of the article as a background for the rather detailed description of the method used as the author's company, an aircraft accessory manufacturer. Evidence of the success of the suggested procedure is supported by specific examples of cost savings.

A SURVEY OF VARIOUS published articles and cost accounting textbooks reveals that much has been written concerning the methods of computing and reporting material price variations from standard. These publications usually emphasize the following problem areas relating to cost control of material prices:

1. Who should set the material price standards? (purchasing, cost accounting, purchasing and cost accounting combined, or other departments).
2. What basis should be used for setting material price standards? (past, current, or anticipated prices, or some other basis).
3. When should material price variances be computed? (upon receipt of vendor's invoice or at the time material is issued from stores).
4. How should material price variances be reported? (Formally, on a weekly, monthly, or quarterly basis, or informally, in verbal or written memo form).
5. To whom should the material price variance reports go? (Top executives, purchasing department, combination of top executives and purchasing, or to other departments).

While individual authors had different opinions regarding the problem areas, practically all are unanimous regarding the use of vendors invoices as the initiating point for all material price analysis. Of course, it is very possible that computing and reporting material price variances at the time vendors invoices are received can be an entirely adequate cost control tool. But, why wait until the material is received? Why not initiate material price control at the source—the purchase order? Disclosure of an unfavorable price difference after the receipt of the invoice can, in most cases, have little effect upon the existing orders. However, disclosure of a price difference upon issuance of a purchase order can often result in an amended or cancelled order, with an immediate saving affected.

DATA FOR STANDARD PRICE DETERMINATION

Requisition No.: 11512 — Part Number: E 4867M7 Rev. K
Date Requisition Rec'd.: 5-5-55 — Description: Adj. Screw
Delivery Schedule: 150/mth. - starting 11-1-55 — Quantity: 750

PURCHASING HISTORY

Part Number:	E 2376M10	E 3385M15
Quantity:	375	1800
Vendor:	Fox Mfg. Co.	ABC Mfg. Co.
P. O. Number:	A 34561 of 4-27-55	A 34278 of 3-25-55
Status:	open	open
Delivery:	75/mth. -starting 10-1-55	300/mth. -starting 9-1-55
Remarks:	Rev. C	Rev. E
Price:	$1.20 each	$.85 each

CURRENT COST INFORMATION

Oper. Sheet: E 3385M15 — Hours: .15 — at $5.00/hr.
Labor Cost: $.75 — Material Cost: $.15 — Other Costs $.05 — Total $.95
Recommendation: — Fair Value: $.90 — Maximum Value: $1.05
Remarks: Only difference between this part and E 3385M15 is length - E 338M15 - 1.87", E 4867M7 - 1.72"

INITIAL ORDER PLACED	CHANGE ORDERS
PART Number:	
Quantity:	
Vendor:	
P. O. Number:	
Status:	
Delivery:	
Remarks:	
Price:	

Signed: JDS
Date: 5-9-55

EXHIBIT 1

Experience at Airborne Accessories

While the suggestion that material price variances be determined at the time the purchase order is issued is the essential contribution of this article, it seems desirable to indicate the answers of Airborne Accessories to the five basic questions.

1. Who should set the material price standards?

   Answer — The cost accounting department because it is in a better position to assemble all the relevant cost data than any other department. Examples of such cost data are the daily receipt of manufacturing cost information including revised production engineering operation sheets and time standards, copies of purchase orders, copies of prior quotations, vendor price lists, part costs as indicated on subcontractor termination claims, and cost data obtained for cost estimating. As an independent staff department, the cost department operates impartially and unbiased, and is not subject to the influence of any operating department.

2. What basis should be used for setting material price standards?

   Answer — Fair and reasonable current prices based on existing market conditions. The material price standards are set for the specific open requirement. They are not used for inventory or other costing purposes, but for control only. Accordingly, the particular quantity and delivery schedule must be considered as well as all other cost data. The standard set many either take the form of a definite figure or a range of prices. Of most importance, however, is the fact that the material price standards are to

serve purchasing as a guide as well as a measure of performance. Past purchasing history is a guide but can often be misleading because of specification changes, substitute materials, and similar factors.

3. When should material price variances be computed?

   Answer—Upon issuance of purchase order or of purchase change order because preventive control is preferable to "after the fact" control. The best control of labor costs is often daily measurement through the use of day work or incentive standards. There is no reason why material price control should not lend itself to the same type of regulation. Many of our purchase orders call for long lead times before the first delivery (3 to 6 months) or call for stretched out deliveries (a 6 month to a year span). Determination of an unfavorable price difference from an invoice would be much too late.

4. How should material price variances be reported?

   Answer — By informal written memo, verbally if necessary to avoid delay because compiling data for a formal report takes time. Delay of a week or even a few days in pointing out an unfavorable price difference may negate the possibility of amending or cancelling a purchase order.

5. To whom should the material price variance reports go?

   Answer — Normally only to the purchasing department. However, copies of memos may be sent to the production, sales production engineering, or engineering departments if pertinent (rush deliveries, substitute materials, particularly expensive design, etc.). Very rarely to top executives. The purchasing department answers our memo with either an amended purchase order, a cancelled purchase order, or a satisfactory explanation of the price difference. We have never had the necessity of reporting a price variance to the procurement director's superior. Top executives need only be advised of unfavorable price differences when they are directly affected (selling prices, procurement policy, design policy, etc.).

Procedure for Controlling Material Price Variances

An explanation of our type of business might better explain our reasons for pursuing the above approach to material price control. Airborne Accessories engineers, designs and manufactures precision equipment for aircraft and industry. Our main lines are electro-mechanical actuators and related systems. Actuators are motor driven gear reducers generating motion in a rotary or linear fashion, and are composed of from 50 to 200 precision gears, shafts, and other parts as well as motor components. The raw materials, such as bar stocks, wire, castings, forgings, are purchased as well as commercial screws, bearings, and other hardware. Machined parts are normally made in our own shops except when our capacity is taxed by unusually high volume. The Korean police action generated such a volume. Our purchasing department had to place orders for many machined parts and subassemblies that normally would have been fabricated in our own shops. The lead time on many of these items was as much as nine months delivery with schedules stretching out over two years. Our system of material price control was instituted to assist, as well as to measure and control, the purchasing department. Our standards were of immeasurable value to the harassed senior buyers as well as to the neophyte buyers.

Our process of material price control starts when a material requisition is placed on the purchasing department by the material control department. The cost department receives

STANDARD PRICE RECORD

Req. No. 11512 Date Rec'd 5-5-55 Part No. E 4867M7 Rev. K
Quantity 750 Fair V $ .95 each Max. V. $1.05 each
Notes Very similar to E 2376M10 and E 3385M15 By JDS Date 5-9-55

PURCHASE DEPT. DATA

Prior Orders and/or Quotations

none

Current Quotations

Fox Mfg. Co.	$1.08 each
ABC Mfg. Co.	.88 each + $75. tooling
Doe Co. *	.65 each
John Co.	1.12 each
XYZ Co.	no quote

* Very bad quality record

Note: Only the first three lines are filled in by the Cost Department. The Purchasing Department adds the other information for their own use.

EXHIBIT 2

a copy of this requisition at the same time as purchasing receives the original. As soon as possible after the receipt of the requisition, the cost department compiles as much data as is relevant and necessary for the establishment of a fair and reasonable standard price (for the exact quantity specified on the requisition, giving due consideration to lead time and delivery schedule). Copies of past purchase orders and quotations are reviewed for the part involved as well as for similar parts. Production engineering operation sheets are reviewed as well as any current cost information available. Freight charges are considered if they will have a significant effect upon the unit costs. The compiled data is entered on a worksheet (Exhibit 1) and along with a blueprint is forwarded to the cost accountant. The cost accountant then establishes the standard price or range of prices and forwards the information to the purchasing department (Exhibit 2). Copies of all purchase orders issued are forwarded to the cost department and are compared with the recommended standard prices. Unfavorable price differences are immediately noted and a memo to that effect is sent to the purchasing department. No attempt is made to delay the issuance of a purchase order because of lack of a recommended standard price. However, regardless of time element, all purchase orders and purchase change orders are compared with recommended standard prices even though there has not been sufficient time to pass on the price information to the purchasing department.

Examples of Success in Controlling Material Price Variances

Our system of material price control has worked out most satisfactorily and has achieved many worthwhile savings. Three examples are presented

to indicate the types of savings achieved:

1. Vendors quotations to purchasing on 790 pieces of one part ranged from $2.15 to $3.50 each. The cost department reviewed some subcontractor subassembly termination claims and found where one vendor was making the part for $.30 each by using special milling cutters. The purchase order was placed at $.30 each with this subcontractor. Savings on this particular order alone amounted to a minimum of $1,400.
2. A purchase order for 400 pieces of a subassembly was placed at $6.00 each. The cost department reviewed all of the component details and advised purchasing that the vendor might be overcharging us by approximately $.75 each. Within a few days a purchase change order was issued reducing the price to $5.50 each — saving $200.
3. A purchase order for 1000 pieces of a part was placed at $5.50 each. A week later the cost department received from the production engineering department a revised operation sheet for a similar part with method and tooling changes indicated and the time standards reduced by 25%. Discussion with production engineering and purchasing resulted in the purchase order being cancelled and a manufacturing order placed on our own shop for the 1000 pieces — saving $850.

Advantages of "Before the Fact" Material Price Control

Naturally, our methods of controlling material prices may not hold for other companies in that personalities, organization, and operations vary from company to company. However, we firmly believe that control of material prices at the source (purchase order) is preferable to waiting for receipt of an invoice. There is also no need to sacrifice cost and statistical data. Purchase orders can be tabulated by commodities and compared with the material price standards set for control purposes as well as the standard costs used for inventory valuation purposes. Trends of control and material costs can then be forecast much sooner than by waiting until invoices are received. Typical advantages resulting from this advance material price information would be:

1. Sales departments could be made aware of material price changes days and even weeks ahead of those competitors whose accounting departments follow the textbook approach to material price variance computation and control.
2. Design engineering could be advised of high cost raw materials and excessive cost design features such as non-standard threads, special tooling, and fine tolerances.
3. Production engineering could be advised of these material price trends so that they might institute prompt cost reduction programs.

A very important by-product of our material price control procedure is the continuous review by the cost department of manufacturing and purchased part costs. Often the purchasing department can procure parts at costs lower than can be obtained from our own shops. All such cases are reviewed and, when possible, open manufacturing orders are cancelled and the parts procured. In addition, any similar or related parts are reviewed to the same end where practical.

Separation of Material Variances Through the Use of Base Standards

by KENNETH J. DASHNER

Staff Assistant to the General Accountant, The International Silver Company, Meriden, Connecticut

The process of separating material variance may be quite difficult when several products are made and several types of materials used. This article illustrates how one company handles the problem through the use of base standards. The method suggested is considered appropriate when detailed analysis of material variances is not considered essential.

TO A GREAT MANY CONCERNS material price variances are not of much importance, either because material cost is a rather small item in inventories and sales or because the variances themselves are small and not of much consequence. However, at International Silver, where inventory values consist of nearly sixty per cent material cost and are made up of such expensive materials as silver, copper, nickel, zinc and steel the separation and analysis of price variances is essential. But our procedure is somewhat unusual in that it is not feasible to change standard material prices annually. Rather the standard material prices are allowed to remain fixed for a period of years until such time as prices more or less stabilize themselves at a new level and new standards can be set which will be fairly close to the market values of metals. Also, due to the many product lines and the many items in a given product line, to change material standards every year to keep pace with the rapidly changing prices of materials would be quite a task. In addition a change would destroy many of our comparative records with other years. Further, since calculation of product costs for price setting purposes are not computed on standard material costs, but rather on market prices with labor and burden at standard, there is no need to change standard material prices every time the market goes up or down.

The Accounting System Used

Each of our factories does its own shipping and billing, has its own payroll and production departments, and places its purchase requisitions through a central purchasing department. The factory accounting departments prepare and summarize the detailed factory production figures into reports for the factory managers and the general accounting department. The gen-

eral accounting department is responsible for comparison of actual with standard costs and analysis of variations, and compilation of standard and actual costs for inventory and cost of sales valuation. It is also responsible for checking and receiving all costs for price setting purposes submitted by factories, as well as the determination of accounting policy (under the controller's direction), and general supervision of factory and general accounts.

A system of "base standards" or "base prices", which are in effect standards of measurement or yardsticks, provides a basis for the determination of standard costs, which are also an integral part of the cost system. The relationship of standard costs to the yardsticks (base standards) results in ratios which are used to determine the monthly standard cost of production and sales, which are built up cumulatively to provide a yearly total. It should be noted that the base standards or yardsticks are different for raw material, the various stages of work in process, and finished goods. In the case of raw materials the base is pounds or ounces, for material in process a fixed price per pound or ounce, for labor and burden in process the standard cost of labor and burden, for metal stock a metal list price, and for finished stock a retail list price (or base price in case the line is not sold on a list basis). It is against these base standards or base prices that the standard cost is measured resulting in a ratio of standard cost to base standard. These are the ratios that are used in costing our raw materials, work in process and metal and finished stock. In contrast to the base standards or yardsticks, the standard cost of the article or line, is a continuous, cumulative cost, building up to the final standard cost of the finished article. All purchases of material and factory transactions are expressed in both standard and base standard form so that ratios for conversion from one base to the other are available at all times.

Distribution of Material Price Variances to Inventory and Sales

Since purchases of materials such as silver, copper, nickel, zinc, and steel are in fairly large quantities, it is not desirable to transfer the variance on a given month's purchases immediately to cost of sales, because of the distortion in the current month's results. Rather on all raw material purchases, the price variance from standard is calculated and transferred to material variance accounts (which are part of the net inventory values). This adjusts the raw material accounts to standard values. (Exhibit 1). From this point on through work in process and finished stock all materials are carried at standard. The balance shown in any material variance account represents the amount of variance applicable to materials in all inventories

MATERIAL PRICE VARIATION ON PURCHASES

ACCOUNT NAME Copper — ACCOUNT NO. 2101

Standard Inventory Price Per Lb. 24¢

YEAR 19- — FACTORY R-27

*Indicates a loss variance (All figures hypothetical)

Month	ACTUAL	VARIATION	STANDARD INVT. VALUE	WEIGHT	BASE STANDARD
Jan.	117,100	* 21,820	95,280	397,000	397,000
Feb.	266,500	* 49,708	216,792	903,300	903,300
	383,600	* 71,528	312,072	1,300,300	1,300,300
Mar.	266,000	* 49,952	216,048	900,200	900,200
	649,600	* 121,480	528,120	2,200,500	2,200,500

EXHIBIT 1

(raw materials, in process, or as finished goods) and they remain here until they go out through "Cost of Sales".

To determine monthly cost of sales, the material content of sales by product line is computed, from data built up from cost records, to arrive at both the total standard cost of sales and the material content of sales. The total material price variance is then divided between the materials remaining in inventory and those sold. The price variances applicable to cost of sales are then pro-rated to each product line based on the material content of that line, thus giving us an actual material cost for each line of sales.

The procedure followed in recording materials and material price variances involves (1) recording all purchases of raw materials by account and factory in a material purchase record, showing actual cost, variation from standard price, standard values, weight, and, where required, a base standard value. (These purchases are taken from a tabulation of material purchases and are posted in total only by account) and (2) transferring these purchases, at actual cost, by kinds of metal to a control sheet which lists the inventory at the beginning of the month, purchases, total of inventory and purchases, and cost of sales showing the amount of variance applied to sales. (Exhibit 2). The material content of sales is calculated by using figures built up from past reports. Starting with the standard cost of sales for each product line, as revealed by the past records, the material content, by types of material, of such sales may be measured in physical terms. This may then be reduced to pounds or ounces of each material required for each dollar of standard cost of sales by product lines, without considering each item in that line's sales. While it is true that this is done on a broad

basis, it does permit us to get a fairly accurate valuation of the material content of sales. Once these factors (pounds or ounces of each material per dollar of standard cost by lines) have been determined for certain basic materials they remain in use for about a year. The one exception to this is silver, where, because of the value involved, a control of this precious metal is kept at all levels of production in ounces, and the factor is determined monthly. The factor in this instance changes slightly from month to month depending upon the product mix. The monthly material price variance applicable to cost of sales is computed by converting net sales of product back to the converting base standard. From this standard cost, material content and the material price variance may be computed. Exhibit 3 is an illustration of the process. One month's net sales of a product line is carried through the four steps involved:

1. Net sales by product line is converted back to base standard by means of ratios determined from the discounts from base sales prices as shown on the net sales tabulation. Conversion from net selling price to base standard is done in total by discount codes, each code representing a certain percentage discount. Once having obtained the total base standard for each line's sales, we apply the ratio of standard cost to base standard cost of finished goods, resulting in the standard cost of sales. These standard cost ratios have been built up cumulatively from production records.

2. After having arrived at the standard cost of sales, we now apply other ratios to determine the material content of sales in pounds or ounces as the case may be. This is done by the use of the factors previously mentioned, which give us the pounds or ounces of material per dollar of standard cost, and is done for all the principal materials such as copper, nickel, tin, zinc and silver, as well as a few less important ones. These ratios or factors, are developed from production figures covering a period of ten months.

3. Having calculated the material content of sales by product lines as described in step two, we now summarize this in total by kinds of material, and enter these material content figures on the inventory control sheets for the respective materials involved, where the amount of material price variance applicable to sales for the current month is now calculated. (Exhibit 2). The resulting material price variance is then pro-rated back to product lines based on the material content of each line, thus giving an actual material cost in the monthly cost of sales figures. (Exhibit 3).

4. The fourth step is to relieve the material variance accounts of the variance as calculated above the transfer these amounts to cost of sales.

With these records and statistics we have available figures for use in compiling monthly reports to top management. One report shows the purchases of material, the amount of variance from standard, the actual price of the purchases, and the standard price. Also shown on this report are the amounts of materials in sales, and at the bottom of the report, the inventory of the principal materials at actual values, and also the market price of materials at the month end. This statement is prepared on a monthly and year-to-date basis, and shows the preceding year's figures for the same period for comparison. One other report which we supply to top management is a comparative summary of material inventories showing increases or decreases in inventories both monthly and year-to-date. At the close of each month,

EXHIBIT 2

PRICE OF COPPER IN INVENTORIES AND COST OF SALES

*Loss Variance

Month	INVENTORY Weight	Price	Amount	PURCHASES Weight	Price	Amount	TOTAL INVENTORY AND PURCHASES Weight	Price	Amount	COPPER IN SALES Weight	Amt. @Stand. (24¢)	Actual Price	Amount	Variation
JAN.	3,500,000	.2932	1,026,172	397,000	.2950	117,100	3,897,000	.2934	1,143,272	695,000	166,800	.2934	203,913	* 37,113
FEB.	3,202,000	.2934	939,359	903,300	.2950	266,500	4,105,300	.2937	1,205,859	648,300	155,592	.2937	190,406	* 34,814
				1,300,300	.2950	383,600				1,343,300	322,392	.2935	394,319	* 71,927
MAR.	3,457,000	.2937	1,015,453	900,200	.2955	266,000	4,357,200	.2941	1,281,453	820,400	196,896	.2941	241,280	* 44,384
				2,200,500	.2952	649,600				2,163,700	519,288	.2938	635,599	*116,311
APR.	3,536,800	.2941	1,040,173											

EXHIBIT 3

STEPS TO ARRIVE AT COST OF SALES, MATERIAL CONTENT, AND MATERIAL PRICE VARIANCE

*Indicates a loss variance

March 19 -

Line	Discount from List (Base) Price	Net Sales	Ratio to Convert Net Sales to Base	Base Price	Standard Cost Ratio	Standard Cost Amount	Copper Content Lbs. per $ of cost	Copper Content Pounds	Copper Content Variance	Nickel Content Lbs. per $ of Cost	Nickel Content Pounds	Nickel Content Variance
1	50%	$ 200,000	2.0000	$ 400,000	.3250	$ 130,000	.2332	30,316	* 1,640	.0617	8,021	* 773
2	45%	800,000	1.8180	1,454,400	.2500	363,600	.2550	92,718	* 5,016	.0750	27,270	* 2,629
Totals		2,000,000		3,500,000		1,225,000		820,400	*44,384		48,000	* 4,627

(All Figures Hypothetical)

Price variance per lb. .0541

Price variance per lb. .0964

after the factory ledgers have been closed and we have the tabulation of inventories, we prepare a statement showing the balances of material price variances that are applicable to the inventories of materials as shown on the control sheets. This report gives the variances at the beginning of the year, increases or decreases to date and balance at the end of the month.

Summary of Procedure

While the application of these material price variances is made on a fairly broad basis, experience has shown that the methods are accurate enough for monthly profit and loss statements. Corrections of any errors can be made at the year-end based on physical inventories. These control records of materials in inventories also serve as a basis for year-end physical inventory valuations of materials.

It might be well to mention that we have a few other items that affect the material variance accounts, the principal one being dross loss (or skimmings) from our rolling mill which casts and rolls the basic metal alloys such as nickel, silver, brass and sterling silver. Also in this category would be differences in weight at the rolling mill due to "variations in formulas", where the formulas are varied from time to time for one reason or another. These items over a period of a year are of some size, due mainly to the dross loss. The material variances applicable to dross loss are handled on the inventory control sheets in the same manner as the variances applied to cost of sales, except that instead of being picked up as a profit or loss item, they are charged to a dross loss account, to which the standard value is also charged. Against this account will be credited any recoveries made on dross through the refining of the skimmings. These figures are charged against the cost of sales reserve. The materials that are charged to dross loss are also removed from the inventory controls of basic raw materials, so as to keep the inventory record of materials as accurate as possible.

We feel that while what we are attempting to do on material variances could probably be improved upon, (and we are, of course, always striving for improvement), that we do have, however, a good sound basis for the application of material price variances, and it seems to work pretty well for us.

Getting Down to Causes on the Labor Variance

by GEORGE B. CLEVELAND

Supervisor of Manufacturing Accounting, Commercial Division, York Corporation, York, Pennsylvania

The problem of adequate analysis of the labor variance has been with us for some time. The procedure followed by one company in providing a meaningful breakdown is covered in this article. An illustration brings the information out in clear and definite terms. Special attention is given to causes of variances from standard time, broken down to four categories.

DIRECT LABOR composes one of the most substantial cost elements in our manufacturing processes. Because of the pronounced effect of this cost element on income and on the ultimate selling price of our product, a significant and prompt measure of this cost is needed if control is not to be lost. Such a measure widely used, but more widely misunderstood, is the labor variance account. What does your labor variance account mean to you? Is it a healthy situation if the standard labor exceeds the actual or is it a warning of trouble ahead? Should you have a variance from the standard? Can you pinpoint your variance to a department or cost center? Are your foremen cognizant of what labor variances mean in their individual departments?

To derive full benefit from standard labor costs, labor variances must be carefully analyzed. To analyze a labor variance, we must first determine the factors making up the standard labor dollars and the factors making up the actual labor dollars. Standard direct labor, when production is computed on a standard time basis, will consist of the total standard time to perform an operation multiplied by a standard rate of pay. Actual direct labor will consist of the actual time to perform an operation times the actual rate of pay plus the bonus and other incentives which are paid to the employee. (Overtime and shift premiums must also be added whenever they are considered a labor cost rather than an overhead expense.) Thus there are two basic factors to consider in an analysis of labor variances. The first is the variance between the standard rate and actual rate paid, or a rate variance. The second is a variance between the standard time allowed for a job and the actual time taken, or a time variance. Exhibit 1 illustrates the computation of these two variances.

The Analysis of the Rate Variance

After the rate variance has been determined, effective control requires that it be explained in terms of the causes for the variance. There are many circumstances which may cause a rate variance. For example, the hiring of a large number of apprentices or a general wage increase will cause a rate variance if standard rates are not adjusted. Also, when standard and actual labor is reported by cost center and standard rates are set for each center, any change in the makeup of the labor skills within that center may cause a variance. For instance a department may be set up to employ five machinists and ten machine operators. If, during an accounting period, this department should employ ten machinists and only five machine operators the actual rate paid will be greater than the standard. This problem is especially prevalent in manufacturing companies with a seasonal pattern in their manufacturing cycle. It is often necessary to reshuffle employees to retain those with longer seniority and greater skills thereby causing higher rates to be paid in certain cost centers than were originally contemplated when standards were set up. This problem should be very carefully analyzed by shop superintendents before transferring personnel from one department or cost center to another.

The Analysis of the Time Variance

Merely to say that the entire time variance is the result of shop efficiency or inefficiency certainly need not be true and such a hasty supposition may prove to be misleading. Four separate situations may be suggested which can affect the time variance, only one of which is due to direct labor efficiency:

1. Bare time allowance — The base or bare time allowance a shop is given for a specific job may differ from the original standard time set up in costs. Any change in shop procedure can cause such a variance. Also a special extra time allowance given the shop, due to substitute or alternate materials, improper scheduling, reworking defective production, or test or trial lots, can distort the time variance picture. Whenever the bare shop time allowance varies from the standard cost time the department should neither be penalized nor given credit for such a variance. Rather they should measure their efficiency by comparing the actual time with a new standard allowance set up to cover the additional time allowance.

2. Personal and miscellaneous time — If an allowance for personal and miscellaneous time, such as time for assembling materials, tools, and clean up, is added into the total standard time, this allowance should be reviewed to determine if the standard cost allowance varies from the shop allowance. Changing shop conditions, influencing the bare or base job time can also affect the personal and miscellaneous time. More prevalent among these conditions would be such items as the well known "coffee break" or rest periods on an extremely tiresome or boresome operation.

3. Machine set-up allowance — In a shop machining area, machine set-up time will be necessary prior to each production run. If standard set-up time for department or cost center is predetermined and incorporated into standard costs, the actual set-up time utilized for a specific period may vary greatly from that standard. The scheduling of production quantities will determine the frequency of actual set-ups and the actual time the worker must spend setting up machine tools rather than on productive work. Regardless of the frequency of set-ups, the shop should be working against definite job time allowances in each case. It is when standard set-up time is added to standard labor costs on a constant or average per-

I **TOTAL VARIANCE**

	Hours		Rate		Dollars
Standard	40	x	1.80	=	72.00
Actual	35	x	1.83	=	64.05
Total Direct Labor Variance					7.95 Gain

II **RATE VARIANCE**

2A Actual Hours x Rate Difference
35 x .03 = 1.05 Loss

or

2B Actual Hours x Standard Rate - Actual Direct Labor
(35 x 1.80) = 63.00 Minus 64.05 = 1.05 Loss

III **TIME VARIANCE**

3A Standard Rate x Time Difference
1.80 x 5 = 9.00 Gain

or

3B Standard Rate x Actual Hours - Standard Direct Labor
(1.80 x 35) = 63.00 Minus 72.00 = 9.00 Gain

EXHIBIT 1

centage basis that the shop allowance of set-up time can vary from the standard considerably. The extent of the variance will depend upon the frequency of set-ups necessitated by the scheduling of work orders.

4. Efficiency — To arrive at the efficiency or productivity of direct labor, all factors must be eliminated from the time variance which are not attributable to above or below average work. When these, such as rate variance, bare time variance, personal and miscellaneous time variance and machine set-up variance have been separated, the remaining standard direct labor variance will be due to direct labor efficiency or inefficiency.

The effect on total labor variance of the above mentioned elements depends upon how often standard rates are revised or adjusted. However, regardless of how often standard costs are changed, your industrial engineers should be striving to cut corners, simplify methods, eliminate processes and utilize cheaper and better materials. Shop methods will not remain exactly the same for a week, let alone a year, so unless standard product times costs change at a constant rate, the time variance arising from changes in shop techniques means that the total time variance can have little significance as far as a measure of efficiency is con-

DEPARTMENTAL LABOR VARIANCE SCHEDULE

Dept.	Standard Direct Labor Hours	Actual Direct Labor Hours	Standard Direct Labor	Actual Direct Labor	Total Variance
Machine	6,542	6,316	$10,932.00	$10,635.00	$+297.00
Assembly	2,662	2,426	4,006.00	3,643.00	+363.00
Total	9,204	8,742	$14,938.00	$ 14,278.00	$ 660.00

LABOR VARIANCE DETAIL

Dept.	Rate Variance	Basetime Variance	Misc. Time Variance	Set-Up Variance	Efficiency Variance	Total Variance
Machine	-81.00	-155.00	- 10.00	+ 92.00	+451.00	+297.00
Assembly	+ 8.00	+ 60.00	+105.00	+202.00	- 12.00	+363.00
Total	-73.00	- 95.00	+ 95.00	+294.00	+439.00	+660.00

EXHIBIT 2

cerned. This suggests that if you cannot measure your labor variance standard costs should be changed as quickly and as often as possible. However, if a true measure can be made of labor variance for control purposes and applied directly back against products or product lines, it is possible that standards will not have to be changed for a long time.

An Illustration of Labor Variance Analysis

Exhibit 2 is a suggested labor analysis report which will help to guide cost control efforts toward the most inefficient areas. However, the preparation and issuance of such a statement is no small task and it will surely be a wasted effort unless all interested parties are completely familiar with its indications and are confident of its accuracy. The biggest job, as a cost accountant, will not be in the assembling of the figures but in educating manufacturing personnel and management in the use of this new tool and in fixing the line of responsibility for each variance.

An explanation of Exhibit 2 is as follows:

1. Rate variance — The rate variance is calculated to be the actual number of hours times the rate difference. This results in a loss of $81 in the machine department and a gain of $8 in the assembly department or a total net loss of $73 for the two departments.

2. Base-time variance — Is the labor variance resulting from a difference between shop time allowance and the allowance reflected in standard cost. The difference results from the fact that standard cost revisions have not kept up with the changes in shop procedure.

3. Miscellaneous time variance — Results from the difference between miscellaneous shop time allowed and the miscellaneous time reflected in standard cost. This vari-

ance includes time for cleaning up, assembling materials and tools, rest periods, etc.

4. Set-up variance — Is the difference between the actual shop set-up allowance and the standard allowance reflected in the cost. Again the variance reflects procedural changes effected faster than they can be reflected in the standard cost of the product involved.

5. Efficiency variance — Will indicate true shop efficiency if all labor variances not directly attributable to above or below average performance have been eliminated. Depending upon the diversity of the manufacturing processes and upon the standard cost system or labor productivity comparison methods, one firm may have more or less time and/or rate variances to consider. However, the major point emphasized is that labor variances must be studied and resolved to derive full benefit from standard labor costs. Such a periodic summary variance report indicates to management and other responsible personnel the effectiveness of efficient cost control and cost reduction in each shop area. The usefulness of this type report stems from the comparisons either weekly or monthly, indicating changes and trends in the variances displayed thereon.

Results Obtained

By such a thorough dissection of labor variance, it is possible to reveal information which will lead to greater efficiency, more accurate costing, and cost reduction. Rate variance may reveal where a skilled employee earning top hourly wages is performing unskilled work. The mix of labor skills in an entire area may be shown to be topheavy with skilled employees. From the time variance breakdown inefficient shop area may be pointed out. Many leads can save dollars and help to make the accountant a more important part of the management team.

Letters to the Editor

PUBLICIZING THE COSTS OF CARRYING INVENTORIES

Editor, N. A. C. A. Bulletin:

A FAILURE ON THE PART of operating managements to relate volume and profit performance to the investment required to produce it, can easily result in excessive plant investment and needlessly high inventories. It is over inventories that production management usually has complete control, not restricted by higher management and it is with inventories that this letter will deal.

It is the prerogative of production management to lay down policies for economical production runs and for protection from work-flow stoppage and worker lay-offs also, for seasonal stockpiling and many other hazards. The process of maintaining complete protection against any of the foregoing can result in heavy inventories all along the line. The accountant can render a valuable service by exposing the financial ramifications involved.

The costs of carrying an inventory are, too often, not fully considered. Although this cost varies considerably, a rough standard developed from many industries is as follows:

	Per Cent of Cost
Insurance	.25%
Storage	.25%
Taxes	.50%
Transportation	.50%
Handling-Distribution	2.50%
Depreciation	5.00%
Interest	6.00%
Obsolescence	10.00%
Total cost per year	25.00%

In multi-plant or multi-division corporations in particular, it is important that higher management be afforded the opportunity for cost comparisons between operating units. Operations involving high inventories can be identified through such comparisons.

In companies in which little has been done with production management on the problem, educational meetings are most appropriate. They can be conducted by or with the assistance of the accountants and can include supervision, production control clerks, storekeepers and buyers. A general presentation can be somewhat as follows:

1. Point out that the company is faced with a problem with which most individuals are faced, namely, the most profitable investment of available money. Note that an individual may invest in:
   a. Savings bank — 2½% or 2½¢ per year on each dollar invested.
   b. U. S. Government savings bonds— 3¾% or 3.75¢ per year on each dollar invested.
   c. Blue chip stock — 5% or 5.00¢ per year on each dollar invested.

   Then ask, in what product lines should the company invest? Comment that an inventory (as a portion of investment) returning a certain dollar rate of profit per year will have its profit rate on investment doubled if the inventory is cut in half.
2. Remind the group that when company funds are released for other use by reduction of inventories, these funds might be invested in lines yielding higher rates of return than present lines.
3. Discuss costs to the company of carrying inventories. Compare these costs with the general savings attained by maintaining "safe" inventories.
4. Present reports of inventory size and number of month's supply on hand as furnished by the accountants.
5. Offer graphs of desired target reductions of inventories. Each month, plot against target curves results attained.
6. Conduct a rough review of inventories. This will disclose many cases of obvious

overstocking, not intentional perhaps but still unnecessary. After this first round, the detection of overstocking will become more difficult. The determination of a properly balanced inventory is a complex problem and all ramifications must be carefully considered before the optimum size is selected.

7. It is most important to stress that, if the company receives more profit per dollar which it has to invest, there will be more and better jobs and improved job security.

The foregoing points pertain to the relationship between the accountants and production management. Higher management also must be fully informed of the best possible return on investment of company funds. This information can be offered in the form of economic evaluation of each proposal for expenditure or through comment letters on sizes and month's supply of inventories.

Improving return on investment is a tool which can be of considerable financial benefit. It does not "force" greater employee productivity, result in lay-offs, reduce quality, or require investing further capital. These are pitfalls of many other endeavors to improve profits.

ROBERT W. HOLMES

A SIMPLE PATTERN FOR EQUIPMENT REPLACEMENT STUDIES

Editor, N. A. C. A. Bulletin:

The accountant has a definite responsibility to help develop cooperation among the various staff functions. Intelligent investment in modern machines may very well be the most important single contribution to successful management. The cost accountant can provide invaluable assistance to the engineer in studying the cost effects of proposed expenditures. With the development of modern machines, capital investment called for by such items must be given very careful scrutiny. The desire to modernize manufacturing methods must be carefully balanced against the resulting efficiency of operation. Once the money is spent, the machine must produce results.

An outline such as Exhibit 1, showing operating results of various proposed expenditures, might be presented to the engineer. This outline shows the effects of proposed expenditures upon net profit, variable profit, return on investment and the break-even point. The first column reflects the current status of an average manufacturing organization with a machinery investment of $10,000 and other assets amounting to $18,000, for a total of $28,000. The net profit before Federal income taxes of $6,000 on a sales volume of $57,000 shows a rate of 10½ percent on sales and the return on investment is 21 percent. The succeeding columns portray the effects of investment proposals.

In Proposal 1, additional machinery is to be purchased costing $10,000. This reduces the labor cost $5,000 but increases the variable burden for maintenance, etc. by $1,000, and adds the same amount to the fixed burden cost for depreciation and taxes. The investment increases from $28,000 to $38,000. Total cost is reduced from $51,000 to $48,000. The net profit increases from $6,000 to $9,000, with a rate of 16 percent on sales. The variable profit rate increases and return on investment increases from 21 percent to 24 percent. The break-even point is lower. All of these changes are favorable, so the proposed expenditure would appear to be justified. However, it is worthy of note that, while the burden cost increased only $2,000 from $15,000 to $17,000, the burden rate increased from 150 percent to 340 percent.

Proposal 2 is the same as Proposal 1 except that an additional machine investment of $20,000 is required (instead of $10,000) for a total investment of $48,000. The burden cost increases $4,000, leaving a net profit of $7,000 or 12 per cent. This is $1,000 more than the first column. How-

ATG CORPORATION

	Current Status	Proposal No. 1	Proposal No. 2	Proposal No. 3	Proposal No. 4
INVESTMENT					
Machinery	$ 10,000	$ 20,000	$ 30,000	$ 22,000	$ 16,000
Other Assets	18,000	18,000	18,000	18,000	18,000
Total Investment	28,000	38,000	48,000	40,000	34,000
PROFIT AND LOSS					
Sales	57,000	57,000	57,000	57,000	54,500
Cost					
Material	26,000	26,000	26,000	26,000	26,000
Labor	10,000	5,000	5,000	5,000	5,000
Burden Variable	9,000	10,000	11,000	10,200	9,600
Burden Non-Variable	6,000	7,000	8,000	7,200	6,600
Total Burden	15,000	17,000	19,000	17,400	16,200
Burden Rate	150%	340%	380%	348%	324%
Total Cost	51,000	48,000	50,000	48,400	47,200
Profit Before Taxes	6,000	9,000	7,000	8,600	7,300
Non-Variable Burden	6,000	7,000	8,000	7,200	6,600
Variable Profit	12,000	16,000	15,000	15,800	13,900
Net Profit Rate	10-1/2%	16%	12%	15%	13%
Variable Profit Rate	21 %	28%	26%	28%	26%
Return on Investment	21 %	24%	15%	21%	21%
Break Even	28,600	25,000	30,400	26,000	26,000
Proposed Changes					
Add Machinery		10,000	20,000	12,000	6,000
Labor Saved		5,000	5,000	5,000	5,000
Decrease Sale Price		-	-	-	2,500
Add Burden-Variable		1,000	2,000	1,200	600
Add Burden-Non-Variable		1,000	2,000	1,200	600
Add Burden-Total		2,000	4,000	2,400	1,200

EXHIBIT 1

ever, the return on investment is reduced from 21 per cent to 15 per cent and the break-even volume increases from $28,600 to $30,400. This would indicate that the cost of machinery required for Proposal 2 is too high, in comparison with the savings realized, to be a desirable investment.

Proposal 3 shows the maximum additional investment possible to realize the $5,000 labor saving and to continue to earn 21 per cent return on investment. Proposal 4 shows the maximum additional investment which can be made to realize the $5,000 labor saving and continue to earn 21 per cent return on investment if 50 per cent of the improvement is passed on to the customer through price reduction.

The accountant should follow up each new product design or new process placed in production to match the operating results against the original estimates, to be certain that original planned improvements are realized. It is evident that progress is the result of close coordination of many operating functions. The accountant has a definite responsibility to recognize his place in this operating picture. He must constantly contribute to the teamwork which will result in modern industrial development.

ALBERT A. RUDKIN

Notes on Current Reading

BOOKS

Tested Approaches to Cutting Production Costs, Overhead—Materials—Payroll

American Management Association, 330 West 42nd St., New York 26, N. Y., 1955, 125 pp., $2.50 to members; $3.75, nonmembers.

This is a cost reduction text of a practical type, written by company officials. Identified as areas of "potential cost reduction" in chapters dealing with each are: paperwork, purchasing, materials handling, the manufacturing cycle, indirect labor, quality control, traffic, inventory management, and maintenance. The separately authored treatments of these areas are followed by four "production department approaches" to cost reduction, also separately authored.

Electronic Data Processing in Industry—A Case Book of Management Experience

American Management Association, 330 West 42nd St., New York 36, N. Y., 1955, 257 pp., $5.75 members, $7.75 nonmembers.

Introduced by a section tracing the gradual change "from manual methods to computers," this volume offers experience of a number of companies within the realm of study and planning preliminary to electronic application and in the realm of application. Here, the experience supplied relates to equipment of varying capacities and to differing subject matters, e.g., customer accounts, production scheduling, general accounting (public utility).

ARTICLES

Decentralization and Intracompany Pricing

Joel Dean, Harvard Business Review, July-August, 1955.

The establishment of genuinely "competitive" pricing of products moving between divisions of decentralized companies is necessary to achieve the benefits of decentralization and to remove the inadequacies of other methods of intracompany pricing, this author indicates and proceeds to develop the positive side of the picture in the body of the article. The paper is readably embraced in ten good-size pages of the periodical and deals point by point with its thesis and the countering of possible objections to it and to the system of "profit centers" involved.

Direct Costing and the Uses of Cost Data

Raymond P. Marple, Accounting Review, July, 1955.

Leaving aside—as obscuring the main issue—whether or not fixed costs should be included in inventories, Dr. Marple considers "direct costing as a method of costing which recognizes variability with volume as the primary basis for the classification and collection of costs, and under which all cost records, analyses, reports, and statements are so developed as to show separately the fixed and variable costs involved." He finds this method serviceable beyond the potentialities of absorption costing and expresses the belief that direct costing, "given time, will become the conventional method of costing."

What Is a Controller?

Edward B. Cochran, Journal of Accountancy, July, 1955.

The title question of this article is answered in its text by an effective discourse on the cost and financial basis of major business problems of today and by an imposing presentation of the management task which demands the virtual partnership of the chief accounting officer, with others, in

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE ACCOUNTANT, *July* 1955 (Moorgate Place, London E.C. 2, England, single copy 1s 6p)

What Manner of Man is the Average Accountant? Robert Jacobs and Arthur E. Traxler.

THE ACCOUNTING REVIEW, *July* 1955 (College of Commerce and Administration, c/o Carson Cox, Ohio State University, Columbus 10, Ohio, single copy $1.50)

New Perspectives on the History of Accounting. Raymond De Roover.
*Direct Costing and the Uses of Cost Data. Raymond P. Marple.
Direct Costing—Should It Be a Controversial Issue? R. Lee Brummet.
Management Thinking Concerning Corporate Annual Reports. Robert D. Hay.
The Army Audit Agency Goes Professional. Clark L. Simpson.
Concepts of Depreciation. Louis Goldberg.
An Analysis of Missouri's Utility Earnings and Rate Base Formula—A Rejoinder. Harold G. Avery.
*Statistical Relationship of Accounting and Economics. Kenneth W. Perry.

ARTHUR ANDERSEN CHRONICLE, *July* 1955 (120 South LaSalle Street, Chicago 3, Illinois)

Accounting Services to Management. A. C. Roberts.
Accounting in the Construction Industry. Elden A. Evenson.

THE ARTHUR YOUNG JOURNAL, *July* 1955 (Arthur Young & Company, 165 Broadway, New York, N.Y.)

Application of Electronic Digital Computers to Business Problems. Leslie M. Mannesmith.
Operations Research—What It Is and What It Does. Robert A. Wofsey.
Use of Future Revenues in the Acquisition of Properties. Theodore Romek.

AUSTRALIAN ACCOUNTANT, *April* 1955 (37 Queen Street, Melbourne, C.1, Victoria, Australia.)

Marginal Costing and Value of Work in Progress. G. T. Webb.

CANADIAN CHARTERED ACCOUNTANT, *August* 1955 (Chartered Accountants Building, 69 Bloor St. East, Toronto 5, Ontario, Canada)

A Costing System for a High Power Research Reactor. D. G. Campbell and W. W. Prest.
Electronics—the New Concept. G. Pyrke Powers.
Accounting for the Plywood Industry. U. E. Houghland and C. G. Chambers.

COST AND MANAGEMENT, *June* 1955 (31 Walnut Street So., Hamilton, Ontario, Canada, single copy $.50)

*Depreciation Allowances and Production Costs. Ernest H. Weinwurm.
*Cost Reduction in Action. William L. Snyder.

THE FEDERAL ACCOUNTANT, *June* 1955 (P. O. Box 53, Washington 4, D. C.)

Modern Sampling Technique. Edwin W. Gaynor.

ILLINOIS CERTIFIED PUBLIC ACCOUNTANT, *June* 1955 (208 South LaSalle St., Chicago 4, Illinois, single copy $.40)

Comment on "Prestige for Historical Cost". George O. May.
*Auditing Electronic Data Processing Systems. Philip Seitz.

JOURNAL OF ACCOUNTANCY, *August* 1955 (270 Madison Ave., New York 16, N.Y., single copy $.75)

Employee Welfare Funds. Hester Ellen Erb.
The Easy Addition of Numbers in Sequence. Fred T. Neely.
Will Accounting Education Improve? R. K. Mautz.
The Decreasing-Charge Concept of Cost. Oscar S. Gellein.

*Further mentioned in accompanying notes.

its conduct. Included is a full-page comprehensive—and also specific—job description for the controller function.

Depreciation Allowances on Production Costs

Ernest H. Weinwurm, Cost and Management, June, 1955.

Here is presented a way to charge depreciation (facilities) costs to production on a current basis by simulation of arms-length rental charge under lease-back or other rental arrangement. Preceding introduction and description of the method appears a considerable amount of material presenting current computation of facilities cost charges as practical necessity for useful costing.

Cost Reduction in Action

William L. Snyder, Cost and Management, June, 1955.

A cost reduction program, instituted by the author's company in 1950 under the committee approach, is set forth in this article. The personnel of the committee includes a representative of the controller's division as chairman and the following members: general works manager, chief industrial engineer, chief engineer, chief draftsman, and the assistant general sales manager. A cost reduction proposal form, summary of proposals, cost saving suggestion acknowledgment, and several other reports are supplied as exhibits to the article.

Statistical Relationship of Accounting and Economics

Kenneth W. Perry, Accounting Review, July, 1955.

The tie-in between techniques of the accountant and of the economist, distinguished in this article, is suggested in the following excerpt, "The business enterprise, in many respects, has outstripped other agencies in . . . dealing quantitatively with economic data. . . . The reporting of this quantitative data by the accountant is . . . indispensable . . . to the business executive . . . and . . . to the economist in his statistical investigations." The text of this article, nevertheless, differentiates at some length the mental world of the accountant from that of the economists and discusses the signifiance of the differences.

Auditing Electronic Data Processing Systems

Philip Seitz, Illinois Certified Public Accountant, June, 1955.

The input, processing, and output stages of accounting routines under electronic equipment installations are compactly covered in this paper for the purpose expressed in the title. The result is a readable and objective view of the course of those routines, as developed to date. Critical points, from an auditory viewpoint, are noted as existing with respect to automatic creation of the transaction record on a tape (perhaps actuated by the time clock, for example), the operation of the equipment's control panel, and control of storage of computation results.

The Strategy of Product Policy

Charles H. Kline, Harvard Business Review, July-August, 1955.

When in the midst of this article there appear a couple of break-even charts, it is clear that, whatever else product policy may be—and it is doubtless many other things as well—it involves cost-price-volume relationship. The impression is deepened when it is noted that sales volume, distribution channels, effect on present products, cyclical stability, raw materials, value added, and manufacturing load are among considerations dealt with. Toward the close of the paper, there is particularized recommendation for formulation of product policy in a statement.

For Your Information

Ring Around Accounting

THE PRESENT PAGES draw attention to a new book, *Economic Accounting*, by John P. Powelson (McGraw-Hill Book Company, 330 West 42nd St., New York 36, N. Y., 1955, 500 pp., $7.50), for its own sake as a text seeking to recognize the applicability of the accounting process to expanded fields and also as marking, through its publication, development of a school of thought which would extend the bounds of accounting widely around its whole circumference. The organization of Mr. Powelson's book may illustrate this point. It is in two parts of about equal lengths. The first expounds accounting by considering it from the points of view of the individual, the business proprietor, the corporation, unit costs, and "statements of the monetary system," thus keeping at least topically within old bounds. The second, after consideration of consolidated business accounts, passes on to consolidated "social accounts," "section accounting," "industrial product accounting," "balance of payments accounting," "input-output tables" and "flow-of-funds accounts." These either establish or require new bounds. The author's subtitle for the work as a whole is "a textbook in accounting principles for students of economics and the liberal arts." This ties in with the closing chapter which, in the light of both portions of the text, considers that now familiar benchmark, "consistency of accounting principles." For students already familiar with enterprise accounting, a prefatory page identifies chapters in the area of social and national accounting which the volume contributes.

(Further description of the contents of *Economic Accounting* will surely be of interest and is supplied below. First, however, it is a reassuring and perhaps fundamental thought that, whether accounting is solely enterprise accounting or also includes industry, area, population, section, or national aggregates of enterprise accounting, there is no indication that it is not still commercial-basis transaction accounting throughout, even considering monetary value adjustments. It may be said that the word, "transaction" is a poor substitute for a yet uncoined word which simply says that completed commercial transactions are acts, each of which is a sale from someone's point of view or purchase from another.—a "salchase" or a "pursale," so to speak. In other words, it is as true of social as of enterprise accounting, i.e., of all accounting in a free economy, that, if you open the books carelessly and all the transactions fall out, they will be like as marbles, except for size, and some will have a blue side up and some a red. The question posed by social accounting is not one of transactions to be accounted for but of entities for which it is practicable and useful to conduct accounting.)

A review of Mr. Powelson's preface may have a further reassurance for accountants. There is some indication that he is fully as much, or more, concerned with drawing accounting—at least, consistent accounting—to the attention of economists as he is with relating overall economic considerations to the accounting process. He reports that, "In the past two decades economic analysis has come to rely more and more on social accounting statements" and also that, "compilers of social accounts depend on business accounting reports for much of their information. The consistency in application of business accounting prin-

ciples to different social accounts creates interrelationships among the latter that can be useful to economic thinking. . . . Unfortunately, the close relationship among different accounting systems has been largely ignored by professors of economics. . . . This book is intended to cover accounting principles that are useful to economists, and to relate them to areas of economic thought." (It should be interpolated here that the foregoing selection of sentences from the author's four-page preface is necessarily not a representation of the full preface but an illustration of one emphasis contained in it.)

The remainder of this description will carry the reader at least a little further into each of the two sections of the body of the book, so that the material may be partly characterized as within or without the more fully recognized field of accounting and as parallel to conventional thinking or a departure from it. That this characterization will be sketchy goes without saying, in consideration of available space, and it may be faulty as well. Its objective is the dual one noted at the start, i.e., to draw attention to a book which embodies a pioneer endeavor based on accounting and to draw attention to the endeavor itself, bearing, as it does, upon the size and stature of the accounting field as a whole. The title given by Mr. Powelson to Part I of his book is "Industrial Enterprise Accounts" and to Part II "Aggregate Accounts." These words seem, by themselves, to designate the familiar and the unfamiliar.

About "Enterprise Accounts"

Recourse to the text, itself, is necessary for proper comprehension of the way in which accounting for enterprises is set off from and related to economic accounting objectives. It can be said here that presentation of industrial proprietorship and corporate accounting is actively conditioned by preparation for the second section of the book. There is frequent contrast or comparison between "business" and "social" accounting. Value is clearly the intended interpretation of the meaning of amounts, except when contexts call specifically for the fact of cost.

The author describes how he plans to treat accounting for business entities as a subject in itself and as an approach to accounting for economic aggregates in the following words in the first chapter of Part I.:

> ". . . This book deals . . . from beginning to end . . . with the basic entries that affect accounting statements. The national income and product account is not described until the student has worked up to it from the grass roots, in two directions. In the first place, he learns to make entries recording the transactions of millions of persons and business enterprises in a country, to draw up their statements, and then to consolidate them into the social accounts. In the second place, he learns to make entries based on national aggregates. He prepares the national income and product accounts from a series of transactions as if a national bookkeeping system existed. . . .
>
> "As the study progresses from the accounts of smaller units toward national aggregates, certain digressions are made, which appeared important to the author. In the chapter on cost accounting, time is taken to mention the relationship between business costs and economic theory, with special reference to marginal cost. A more significant digression takes us into the field of banking."

About Aggregate Accounts

In embarking on Part II with a chapter entitled "Consolidated Statements: 1. Business Accounts," the author again makes

clear the road being traveled and for which the chapter's content is partly transitional, in the following words:

> "While accounts of individual business provide data on their own operation, a consideration of broader economic questions demands statements covering larger groups. For example, an oil combine may have a far-flung domain, with producing companies on three continents and markets in all corners of the earth. The unified management and policies—require accounting statements for the group. Economists seeking answers to such questions as 'How will business act?' and 'What are consumers doing?' need statements of the economic activity of all businesses and all consumers rather than of industrial enterprises and persons."

When it comes to the succeeding chapter, "Consolidated Statements: II Social Accounts,"

> "consolidated social accounts are introduced through the business income and product and the investment statements. These have already been described as the economist's version of the profit and loss statement and the balance sheet, respectively, of business enterprises. . . ."

Inasmuch as the remainder of Mr. Powelson's text is directed to structuralizing in accounting terms processes for development of accounting-economic statements, it may be the most helpful introduction to it to note briefly the author's identification of these areas.

With respect to sector accounting,—the idea is fundamental to social accounts—sectors are presented as economic groups, e.g., business, consumers, etc., "responding in different ways" to economic events, such as an increase in prices. An initial illustration is of two-sector accounting in which the business enterprises of an economy are one sector and "outsiders" the other. The idea of sector accounting is then developed through chapters in which thirty-nine "transactions" in material product accounting (e.g., production of inventories, liquidation of inventories, production of fixed assets, import of merchandise, rent of homes and apartments, government payment of interest on public debt) are described and given entry form, and applied to for sector accounts for (1) business, (2) the government, (3) rest-of-the world, and, (4) personal.

The closing chapters of *Economic Accounting* concern balance-of-payments accounting, input-output tables, and flow-of-funds accounts. It is stated that "balance of payments is a consolidated statement of economic transactions of residents of one country with foreigners. . . . An important instrument for assessing those problems of internal origin which have repercussions on a country's international economic position." One of many identifying comments on input-output tables is that they "divide the business sector into a number of separate industries. All transactions of individual enterprises with other firms are recorded, whether the latter belong to the same or different industries. . . . Combined rather than consolidated data are the order of the day. . . . it (an input-output table) shows the distribution of final product among the three sectors capable of ultimate consumption—households, government, and the rest of the world." Flow-of-funds accounts are compared to balance-of-payments statements as an adaptation for domestic transactions, and are also differentiated from such statements.